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ABSTRACT

This book examines trends in current educational literature and how they impact geography instruction. The volume contains 22 articles divided into 5 sections addressing geography innovation and educational research in geography. The introduction by Hans van Westrhenen and Gerard Schoenmaker delineates the foundation for the book and the theme areas for study. Section titles are the educational trends identified. Each section contains an introduction written by one of the editors. Section 1, "Knowledge and Skills," contains: (1) "Concepts and Models for Understanding Our World" (Maryse Clary); (2) "Visualization of Environment through Graphics" (Rod Gerber); (3) "Children's Understandings of Patterns and Relationships in Visual Stimuli: Teaching for Meaning" (Margaret Robertson); (4) "A Constructivist Approach to Children's Understanding of Thematic Maps" (Patrick Wiegand); (5) "Ideological Propaganda in Maps and Geographical Education" (Yoram Bar-Gal); (6) "Meaningful Learning in Geographical Education" (Shi Xuan); (7) "An Exploration of the Role of the Teacher within Enquiry Based Classroom Activities" (Margaret Roberts); and (8) "Concept Mapping in Geographical Education in Nigeria: From Theory into Practice" (Julie Okpala). Section 2, "Old and New Media," includes: (1) "Reader, Text, Metadiscourse and Academic Argument" (Alan Lester; Frances Slater); (2) "The Design of Graded Geography Worksheets for Mixed Ability Students" (John Chi-kin Lee); (3) "Using Cooperative Learning with Computers in Geography Classrooms" (Christine Kim-Eng Lee); and (4) "Computersimulation and Environmental Learning: An Approach to Geolab" (Volker Albrecht). Section 3, "Environmental Learning," offers: (1) "Promoting Geography as a School Subject through Pupil-Centered Activity and Research" (Rex Walford); (2) "A Strategy for Geography Fieldwork" (Ashley Kent); (3) "Involvement, the Key to Environmental Education" (Henk van Dijk; Lex Stomp); (4) "Preliminary Exploration of Decision Making in Geography Lessons" (Letje Veldman); and (5) "Not a Waste of Effort" (David Cooper; Chris Coggins). Section 4, "International Cooperation," examines: (1) "Achieving a European Dimension in the Training of Geography Teachers: Review and Future Perspective" (Andrew Convey); and (2) "International Understanding and Cooperation through

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Innovation in Geographical Education

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PREFACE

This book on "Innovation in Geographical Education" is a unique response to our Commission's call to promote international cooperation in Geographical Education. The "International Charter on Geographical Education" published by the Commission in 1992 states:

> *"In order to promote international co-operation, geographical educators should support the aims of the Helsinki Accord (1977) to promote the bilateral or multilateral exchange of experience, in teaching methods at all levels of education, including compulsory, further and higher education, the exchange of teaching materials, and the findings of research on curriculum development, pedagogy, methods of evaluation and epistemology.*
> *Geographical educators and teachers in all countries are encouraged to promote such exchanges through the work of the Commission on Geographical Education of the International Geographical Union and through the many other international institutions and specific research projects which have geographical relevance and an educational dimension."*

A look at the national origins of the authors of this volume illustrates its broad international dimension while the range of papers presented illustrates the innovative educational dimension of this publication.

On behalf of the Commission on Geographical Education of the International Geographical Union, I would like to express my gratitude to the editors and authors whose commitment has led to this impressive result.

The innovations described here and their pedagogical spirit will undoubtedly have a fruitful impact on the practice of Geographical Education worldwide.

Prof. Dr. Hartwig Haubrich
chair of the Commission on Geographical Education
of the International Geographical Union

INTRODUCTION

Hans van Westrhenen and Gerard Schoenmaker

1 The theme

Innovation in Geographical Education. As a theme, it does not seem exactly noteworthy for its originality. However, while the choice may not be original, it is certainly justifiable when we consider the drastic changes being introduced in secondary school curricula and examination syllabuses around the world. Faced with current social developments as well as those in environmental awareness and increasing awareness of internationalisation, changes in education and schooling are not occuring in isolation in just a few countries, but are being implemented worldwide. This fact alone provides the editors with sufficient reason to choose Innovation in Geographical Education' as the main theme for the 1996 IGU Commission on Geographical Education (IGU.CGE) Symposium as well as for this book.

2 Global trends in curriculum innovation

Once Innovation in Geographical Education' was chosen, the editors of this special IGU.CGE issue considered innovative ways of addressing the theme based on those current developments and trends that may be distinguished in international educational journals. A study of these journals reveals which developments are ephemeral phenomena and which contribute to trends in curriculum development or education oriented research. A number of such trends can be identified across almost all school subjects.

They include the following guiding principles:

1 education must help students to learn how to acquire knowledge independently;
2 there should be strong emphasis on general skills acquisition as well as on the development of subject specific skills;
3 much attention should be placed on metacognitive skills within the learning process so that students may have the opportunity to steer their own learning processes;
4 there should be increasing attention paid to attitude development and the meaning of values;
5 there should be a focus on the implementation of new media in the process of knowledge acquisition and information processing; and
6 curriculum content should be adapted to meet changing priorities: for example, in geographical education there now needs to be a stronger emphasis on themes such as environmental learning and international understanding than previously.

Frequently these proposed changed in education have their origins in social developments. Developments in society as a whole make different demands on the knowledge of students who leave school, not only regarding the subject matter content, but also whether graduates will be able to use their knowledge fruitfully in new situations.

3 Linking content and learning processes

It is interesting to observe similarities in the changes taking place in the curricula and examination syllabuses of countries around the world. One of the most notable trends is that curricula no longer just enumerate subject content but require that a clear link be made with learning processes. Gregg & Leinhardt (1994, p. 344) emphasis this point when they explain that knowledge of, for instance, maps is not sufficient on its own, but that insight is required into the learning processes by which students can acquire this knowledge. Within geographical education there are few empirical foundations to support such a view. Even in the area of map use many publications can be characterized as the wisdom of practice rather than [as] empirical study'. Gregg & Leinhardt (1994, p. 351) conclude that in geographical education research more attention should be given to learning processes within the context of geographical knowledge acquisition.

4 Separate aspects of innovation in geographical education

The trends identified in current educational literature as well as the contributions submitted led the editors to distinguish the following themes:

1 Knowledge and Skills;
2 Curriculum Development;
3 Old and New Media;
4 Environmental Learning; and
5 International Cooperation.

Three of these themes deal with aspects of curriculum innovation or with the innovation of geographical curricula as a whole: Knowledge and Skills, Curriculum Development, Old and New Media.

1 The key issue in the theme Knowledge and Skills is which knowledge and skills are worthwhile teaching and learning through geographical education and what is the best way to achieve this. Geographical key concepts are discussed as well as methods of learning and instructing.
2 Following the discussion of knowledge and skills we offer some reflection on curriculum development. What aspect of geography should students of a specific age group master, in what order and in what manner? How should geographical education be organized over the years? How can we ensure that what is taught and learned in the geographical curriculum will have a high transfer value? Such questions become topical whenever social changes make new demands on education.
3 With the rise of computers, society - and as a consequence, education - has changed rapidly. The age of information technology is upon us, and presents an enormous challenge to geographical education. How do we prevent students from getting caught in the WEB or lost on the electronic highway? Unprecedented opportunities present

themselves for the quick visualization of information and for communication with students elsewhere.

The remaining separate themes, Environmental Learning and International Understanding, consider subject matter content and point to the increasing importance of these themes within curricula.

4 Our environment is subjected to increasing pressure and geography is the outstanding subject to study the possibilities and limitations that nature offers human beings at various scales, geography shows the limits of what nature can stand. Field studies can make students aware of the resources and vulnerability of the world in which they live.

5 Contact with other cultures is part of our students' daily social world. They are often confronted with other cultures, mostly through television and their school. These confrontations are not always positive. Sometimes even xenophobia and discrimination rear their ugly heads, even in a world in which people are economically more and more dependent from each other. With the increase of international dependence, mutual understanding becomes vitally important. Geography can contribute to international understanding, it can offer knowledge about other countries and nations and it can lead to reflection on one's own values.

5 Target group

The explicit choice has been made in this volume to reach not only researchers but also geography teachers well. Teachers play a crucial role in the success of curriculum innovations. The key issue is what knowledge and abilities teachers must have to enable students to orient themselves in a rapidly changing society with the help of geographical knowledge and insights. Any innovation project that does not fulfill this demand is doomed to failure. From this perspective it is obvious that this book should be accessible especially to interested teachers. From there, it is only a small step to continue towards student teachers. Encouraging student teachers to be open to meaningful innovations cannot be started early enough.

6 Criteria presented to the authors of this volume

The intended target group audience the desired link between geographical content and learning processes led us to present a number of criteria to our authors. The authors were asked to fulfill the following requirements in their contributions:

1 to indicate on what geographical and (learning) psychological educational theories their contribution is based;

2 to indicate what method has been used to translate' these theoretical notions into instructional materials;

3 to add examples of instructional materials; and/or

4 to build in assignments and suggestions that will be useful for student teachers.

Although not all authors have kept strictly to these requests, the chapters of the book are each structured broadly on these criteria.

7 Research into the learning processes within geography

When we look at the articles in this volume, we are again reminded of the words of Gregg & Leinhardt concerning educational research in geography. Trends in curriculum development indicate that in the years to come more emphasis will be given to learning processes within school subjects. It is to be expected that themes such as the implementation of investigative skills within geography will play an important role. Besides, there will be more attention for metacognitive skills and the independent acquisition of knowledge. Given the relatively small number of active researchers within geographical education, perhaps we should consider the wisdom of concentrating our combined efforts on one of these themes.

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SECTION A

KNOWLEDGE AND SKILLS

KNOWLEDGE AND SKILLS: INTRODUCTION

Hans van Westrhenen

In view of the many publications about skills in education in the second half of the eighties, the theme of knowledge and skills is an important issue in educational research. The importance of training in skills has been emphasised throughout the nineties. Without skills pupils are not able to make use of other aspects of their knowledge. As procedures which enable us to connect new information to existing factual or conceptual knowledge, skills are an important part of our total store of knowledge. In education, acquiring knowledge and training skills should go hand in hand as far as cognition is concerned.

In many countries we have seen an emphasis on skill development and training in the development of innovative curricula. In the opinion of most teachers and researchers, the best place in the curriculum to promote the development of skills is within the existing subject disciplines and not as a separate course.

The first chapter in this section is written by Clary. Her theme "Concepts and models for understanding our world" is a good framework for the rest of the chapters in this section. Clary discusses the core and function of geographical knowledge and makes a link with learning processes. According to Clary, key concepts and models for understanding the world are the instruments for students to recognize spatial patterns. She does not see the study of regions as the ultimate aim of the geographer, but rather that the study of different regions help us to learn to discern spatial regularities and areal differentiation in the world around us. However, teachers should teach not only geographical skills, Clary says. They should also teach metacognitive skills to help their students to use their knowledge productively.

In this section of the book three chapters deal with map skills. Map skills are essential for the geographer. Map skills can be divided into map reading, map analysis and map interpretation. These three differ in complexity but are all necessary to understand the information visualised in maps. Not everybody has the same map skills. In this section Gerber, Robertson and Wiegand discuss some aspects which influence the acquisition of map skills. In chapter 2 Gerber writes about thinking skills in relation to visualization. He illustrates his ideas in student materials. In chapter 3 Robertson shows that visual stimuli in maps are important aspects to promote "understanding a number of key concepts including description and location of places, patterns and relationships in distributions of spatial phenomena". Using a constructivistic approach, Wiegand explains in chapter 4 how teachers can help students in an interactive geographic learning process. A process in which students learn to understand the meaning of the symbols on a map and, in doing so, create their own mental map of places and regions.
In chapter 5 of this book, Bar-Gal shows that maps can also be misused. Not only outside the classroom, but also inside the classroom, maps can be used to influence people's mind. Bar-Gal illustrates this in his chapter "Ideological Propaganda in Maps" with some maps used in

education in Israel. At the end of his contribution Bar-Gal discusses the relation between cartography and aims for geographical education.

Shi Xuan suggests in chapter 6 about meaningful learning in geographical education that if knowledge does not seem to be useful in the opinion of pupils, the proces of knowledge acquisition will be hampered severely. Starting from the work of Ausubel, Shi Xuan formulates some ideas about meaningful learning in geography. He discusses the conditions under which instructional materials can initiate meaningful learning.

Productive learning demands good instructional materials and teachers who have a good repertoire of classroom techniques. In chapter 7 Roberts describes "an exploration of the role of the teacher within enquiry based classroom activities". The model for enquiry based classroom activities described seems to be an excellent tool to help us to reflect on the processes of education students are involved in.

Finally, Okpala discusses in chapter 8 the importance of concept mapping in geographical education.

1 CONCEPTS AND MODELS FOR UNDERSTANDING OUR WORLD

Maryse Clary

1.1 Introduction

Man is an actor in the geographical sense and geographical places are his living space; location, form, structure and activity work together to differentiate his own from other places, but all the relationships which he has within space merge together into a whole which is made up of feelings, values, collective memory and symbols...In our societies, however, public authorities also have an effect at the regional level, influencing the choices made by business, and modifying the spatial behaviour of individuals by making new areas open for tourism and by planning decisions. So where does geography fit into all of this?

> *"It analyses human distribution phenomena and their manifestations in space, it makes studies at the local scale in order to better understand spatial configuration; it differentiates among regions; in a word, it positions itself" (Brunet 1989).*

So, geography plays a specific role at the heart of the social sciences, being nearest to the ground, to practical matters and to action. In the explanation of basic scientific truths, and of the demands of human beings, the teaching of geography will allow young people to become familiar with the world in which they live, will give them a full scientific representation of that world and provide them with the conceptual and methodological tools which are indispensable for anyone who wishes to understand space and society. Geography may therefore be regarded as more of a practical operating system than something which is taught, helping to analyse and to explain the distribution of spatial phenomena and their impact upon the surface of the earth.

In order to be able to respond to these needs, the training of teachers must be seen as a dynamic process, where the trainee becomes the prime mover in his or her own training process. Teachers in training must be encouraged to think epistomologically as well as didactically, as this is indispensable when deciding the structure of the knowledge which is to be passed on to their pupils; they need to be able to analyse the content of geography teaching and to formulate the knowledge to be taught in terms of scientific knowledge in general.

1.2 Theory

1.2.1 A change of paradigm

In common with most of the newer sciences, in its process of renewal geography sees its scientific position being at the heart of constructivist epistemology, while the more classical geography was in sympathy with the epistemological positivists. The formula put forward by Bachelard (1938/1982) makes the distinction between the two paradigms very well, *"nothing is ready-made, everything is constructed"*. Therefore, geographical knowledge and understanding become fundamentally processes of research into mechanisms, rather than descriptions of appearances.

1.2.1.1 Analyzing the production of "spaces" by societal groups

A number of contemporary geographers (Bailly 1991) define their subject by a series of questions: who, what, where, how or why? These questions relate to those groups which occupy a space, together with their values, their styles of life and their actual experience; with their economic, social and cultural product arising from the resources available, together with organizations, technology, exchange and their locality. Now, in those places and spaces which society produces, not all types of activities are possible, which makes us return to the problems of structure and of spatial distribution in the light of knowing what man has gained from his living space and the uses to which he has put this space. The "why" and "how", if we follow Bailly's argument, cast some light upon the objectives of individuals and groups in the establishment of their spatial relations. In consequence, geography would become:

> *"a study of production in space by societal groups, those distributions and differences which they develop, the locational patterns which arise from this, as well as the types of places which grow up" (Bailly 1991)*

In the end, geography must give an explanation of the genesis of structures and the spatial dynamics of societies. There is therefore, a way in which we may arrive at this geography, starting from the production of spaces by human groups:

> *"Geography, so re-defined, may identify itself more readily with the other social sciences: it teaches about places, says what they are, how they relate to one another, how man and therefore society conduct themselves on the earth's surface, which they transform to a greater or lesser extent by their actions" (Dollfuss 1989).*

1.2.1.2 An analysis of spatial practices and processes

So geography consists of analyzing spatial practices and processes. True mental construction, for which the researcher makes choices which appear to be significant, eliminates a certain

number of characteristics which are not considered pertinent to the question, in favour of others, all of this being designed to make progress in comprehension. He or she must, therefore, explain the problems and concepts which were used in constructing such knowledge. The study of spatial organization and social product, the investigating of the actors, the strategies, of what is at stake, such an approach puts an emphasis on processes and turns its back on a traditional geography where space was something concrete, natural and a fact. It is, all the same, a geography which permits pupils to understand spatial phenomena and the processes by which space is created, its different levels of articulation and its different actors. An area is a construct.

> *"Geographical knowledge therefore rests upon an analysis of the interaction between society and space and it emerges essentially as an elaboration of general concepts, of consistencies and models, which come together in the field of abstraction" (Clary et al 1994).*

1.2.2 A conceptual geography

1.2.2.1 Concepts; instruments of intelligibility

From a perspective of basic truth, concepts are instruments which allow us to probe the intelligibility of the world, for pupils to put some order into complexity and to organize their world.

Keeping within the spirit that concepts, more in their intention than in their application, never appear alone but are always interacting with one another. We would say that a concept only makes sense at the centre of a network, where the hierarchy changes with a given situation, with the problem which is posed and with the hypotheses which are being put forward. These are the same concepts which are regarded with some apprehension at different educational cycles from the elementary school to the university, but at differing degrees of comprehension, formulation and mastery in the strategies of different learning systems; in line with the spiral process of Bruner (1962),

> *"the acquisition of concepts is one of those things which one traditionally called thinking. The act of formulating categories emanates from the capacity of man to move from sign to significance" (Bruner 1971)*

A complete definition of a concept must include at one and the same time its denomination, its essential attributes and a hierarchy of its elements.

1.2.2.2 Key concepts in geography

Geography is characterized by a certain number of key concepts, which should be found at the heart of its teaching. In fact, for most of the time they are not there, or perhaps only vaguely present. One of the goals of geography teaching is that the pupils should gain some knowledge of the subject's conceptual structures. Using one of these key concepts, place -

a basic unit in geography - Brunet (1989) in his article *"The omnipresent unit of geography"*, lays out a conceptual system for geography (Figure 1.1):

- the accent is put upon the basic notion of "place", its significance at the heart of a network, which portrays the lattice (grid) of an area, its linkages (and limits), its location in respect of other places (axes, flows, barriers), and in those fields which arise in the social, cultural, political, economic or natural contexts, and which may be less clear at other scales of analysis. It is their ordering which describes the place in question.
- the accent is also put on the actors and strategies, and demonstrates in which places and regions one finds a social product born of relationships of force, politics, administrations, practice and manifestations of the actions of individuals.
- this in turn gives rise to a network of relationships which is a combination the two above and which is much more complex. Each of the basic concepts transforms itself into a conceptual network. The geographer studies areas or distributions of phenomena in their dynamic state. He or she identifies the processes and actors involved in the light of spatial laws linked to the actions of society, the most significant of which are related to distribution, distance and to the phenomenon of gravity. In the light of these laws, the reactions of societies are subject to the influence of their own representations.

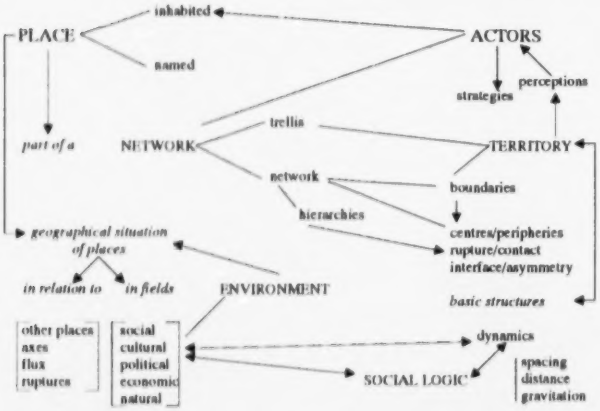

Figure 1.1 Concept mapping of social space (after Brunet 1989)

1.2.3 Model building in geography

By the use of symbols, model building is an deliberate activity of elaboration and construction, which is capable of rendering more understandable a phenomenon which appears to be complex, and of developing the reasoning of the actor who wishes to intervene at the heart of the phenomenon:

> *"in order to think of a model, it is necessary to think about an object arising from a sign; and that is no longer a given object but a perceived object."* (Raffestin 1988).

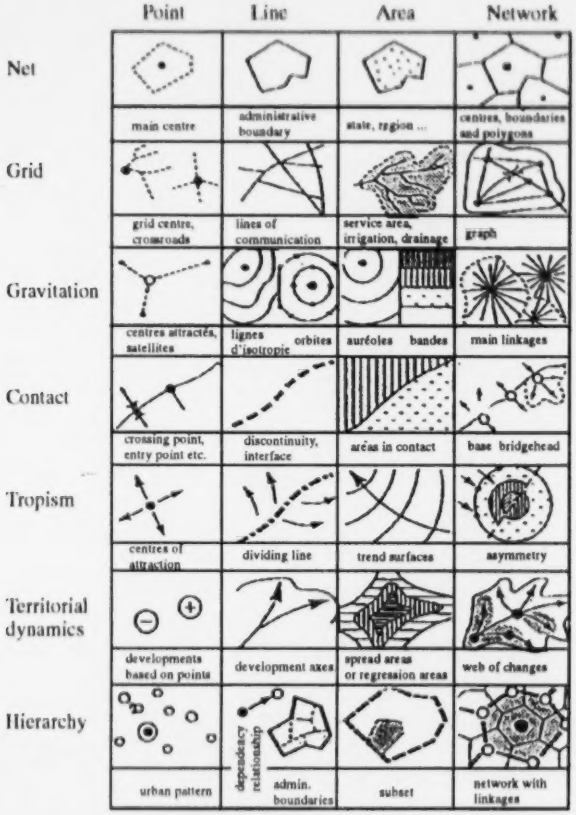

Figure 1.2 Table of choremes (Brunet 1986)

1.2.3.1 A conceptual representation of space

Geography makes use of models in order to render the reality which is being studied more intelligible. To construct a model of spatial organization is to pass from a state of dis-organized truth to an interpreted reality; to effect a choice from a mass of facts in order to solve a problem. Each model constitutes a theoretical framework which allows a given situation to be defined. By making clear the essential points of spatial relations, the graphic model portrays a conceptual representation of space. Model building calls for two operations, the analysis of perceived or conceived reality in a system which is an abstraction, and the compiling of this system into a graphic language.

Elementary models or choremes (Khorê, "space") are basic spatial structures which are represented by a graphic symbol and are transferable from one place to another. By contrast, combinations of these basic models, which give the cartographic model, become highly specific in terms of organization and place. Brunet (1986) brought out a chorematic table (Figure 1.2), in which he set the 4 basic graphic elements - point, line, area, network (already itself a combination of point and line) - against 7 geographical concepts, thereby getting 28 variables, a veritable alphabet to use in writing about and unraveling space, a tissue for assigning regions, a grid for servicing an area; the concept of gravity which imitates attraction and influences; the effect of distance, the concept of contact whether hostile or harmonious; the concept of directional flows which encourage asymmetrical and/or distorted space; the concept of movement which finds expression in conquests and withdrawals, and the concept of the hierarchy. Such choremes demonstrate the ways in which societies have organized their regions. No model can however represent all the properties of a system. The model is therefore incomplete, but it nonetheless allows us to advance our understanding of complex phenomena.

> *"To construct models is to know how to jettison information in order to improve our knowledge of a phenomenon....the model does not result from a process of simplification, but from a choice; it is also possible for different models to arise from an analysis of the same reality" (Clary & Ferras 1987).*

1.2.3.2 Spatial structures and processes

It is possible to relate all spatial phenomena in their existing state, their dynamic characteristics and their functions, to a reduced number of elementary models. As graphic symbols only make sense in terms of the concepts which underlie them, the reconstructed reality of the model is dependent upon a conceptual framework. A combination of elementary models allows us to advance the analysis of complexity, in order to discover the explanatory phenomena of space-time, of scale and of regional dynamism. The development of every model starts from one or more hypotheses:

> *"to model space is to revert to searching for its structures and its dynamic foundations....it is first to ask what may be the basic principles at play, and afterwards to form hypotheses. And to test these hypotheses." (Brunet 1986).*

Graphic models are representations which are intelligible, artificial, symbolic and situational. To construct these models is at one and the same time to identify and to formulate problems and to seek to resolve them by making use of simulations: to learn model building is to be initiated into complex thinking and to the posing of problems. By developing models, the geographer or the trainee geographer no longer works with first-hand reality, that of the earth's surface, but at a higher dimension, that of the structures and processes which he or she devises. By combining various spatial elements, the pupil may build the world, passing from an egocentric to an exocentric position.

1.3 Methods

The most important thing is not to describe and explain all that is found on the surface of the earth, nor to accumulate knowledge about all types of planning, but to understand how human space or societies acting in space actually work, to reason geographically and to think in spatial terms. It is not so much studying places for their own sake, but studying them as spatial relationships, demonstrating the elementary structures of space, first of all revealing these in a straightforward manner to younger pupils and later becoming more profound and complex, in line with the pupils rates of development. It is demonstrating those processes which work at differing scales, from elementary place to plural space, to emulate the principle of interlocking *"Russian dolls"*, according to the classification of Moles & Rohmer (1972), in structures which are changing and evolving through time.

1.3.1 Teaching from basic principles

1.3.1.1 Encourage an ability to think in structural terms

One of the fundamental objectives in geography teaching should be to arrive at a situation where the pupils put some order into their own spatial representations; in a world where more and more of these representations at different spatial scales are somewhat removed from their daily experience in actual terms, or as presented in the media. The problem is to get them to adopt structures which allow the pupils to organize their experiences. Another is to encourage them to reflect upon possible approaches to spatial problems, on ways of understanding practice in the spatial field, and the ways in which one may think about the concept of space. In effect, there is not only one but many perspectives involved in our own portrayal of space.

1.3.1.2 Encourage an ability to reflect in metacognitive terms

From the earliest age, a pupil is a user of space; he or she has their own system of explanation for the world which surrounds them and they hold on to this knowledge; and any teaching not founded upon their own representations remains purely illusory. It seems to be essential to seek to integrate this hard core of knowledge of spatial phenomena. It implies a change of direction in the methods and purposes of traditional geography by taking fully into account the existing representations of the pupils, and by the putting into place of alternative pedagogical approaches; *"from last to first and from top to bottom"* (Bailly 1989), the teacher will become a regulator of the construction of geographical thought in the pupils, and will lead them towards a process of metacognitive thinking in the construction of their knowledge base.

In order to achieve this, the teacher will need to lead the pupils towards a recognition of the structure of their representations of space, to get the pupils to face them and to reflect upon the sources of their differences. In this way, one will facilitate in the pupils a better understanding of their own living space, but also of other spaces by means of comparison and one

will put them into contact with different geographic scales and with their all-surrounding space. This way of thinking may then assist the pupils towards the solution of spatial problems.

1.3.2 Systems and modelling

Every geographical study must seek to highlight the many relationships which underly or explain a given situation, distribution or case of evolution, or the factors which create their dynamic structures. Every region and each part of space may be thought of in terms of systems.

1.3.2.1 Towards an effective spatial analysis

Certain spatial objects may be singled out as being the components of a system, or as being sub-systems. The inter-relationships which take place between places may be regarded as taking the form of flows. In any hierarchical system, flows are inevitably asymmetrical and cause a state of disequilibrium which can, it this gets stronger, cause a break in the system, which may change the differing values of places. Any part of the earth's surface is always an open system, and exchanges exterior to the system (energy, goods, humans, information, capital.....) are indispensable to the system's functioning and effect its evolution. To think of the world as a system is to give priority to the flows over the elements; it is to organize, structure and to put the elements and sub-systems into hierarchies, for the world as a whole or for supra-national space; that is to say to consider the bases of the organization of space before proposing any sub-divisions.

> *"Effective use of such a scientific approach is dependent upon effective spatial analysis" (Auriac 1989).*

In addition to this, an understanding of any section of the earth's surface may be reached at different and inter-connected levels; in other words, they may be regarded as real hierarchical systems. Moreover, certain phenomena such as diffusion are to be found at different scales and may also be expressed in terms of processes and models. Following a route from the local to the supra-national, the larger the space under consideration, the greater the number and the nature of the relationships. Beyond the straightforward hierarchical relationship, between these spaces and zones one discovers further discontinuities and mutations. At every scale there are interactions and hierarchies which show, as in any system, that there is a necessary integration of all parts of a system in relation to the system as a whole. But at every geographical scale there are also perceptions to take into account, together with social practice. In these conditions, the approach of the geographer has similarities with a constant coming-and-going between the two points of reference of observation and analysis, an egocentric reference corresponding to the conception of space built around a subject, and an exocentric reference corresponding to a conception which is independent of the subject.

1.3.2.2 A transverse method

In order to be able to understand complex realities, it therefore seems to be necessary to put the accent upon globally organized knowledge, which is alone capable of articulating specialized skills:

> *"It is the great merit of contemporary systems analysis that it has renewed and re-argued the conceptual apparatus by which we may perceive those phenomena which we are investigating" (Le Moigne 1990).*

Any initiation into a systems approach must be undertaken in a methodical manner. A complete breakdown may occur at the level of thought processes, *"thought becomes all-embracing, causality becomes circulatory and time becomes non-reversible, these being three concepts"*, as Guigo points out, *"which permit us to deal with problems of the dynamic"*. This form of transversal thinking permits a dialogue between the different disciplines involved in education.

1.3.3 A process of active knowledge

A process of active knowledge lies at the heart of model building. Pupils and teachers are creators of new knowledge in a particular context, as knowledge is developed by the model builder when he or she plans the continuing interactions between phenomena which are perceived and conceived. A correlation exists between the activities which pupils are following and the acquisition of knowledge, which comes not only from theoretical learning but derives also from an aptitude to experiment.

There is no learning which is not some kind of response. Starting from this idea, it is important to place the subject in a situation where questions will be asked, thereby encouraging in the subject a desire to know. Varela (1989), in his model of *Enaction*, considered that the subject, when faced with the object, built up something which was at one and the same time related to the structure of his/her intelligence, and to the particular constraints of the object in question. The problem is therefore to develop a capacity to analyse constraints relative to a given piece of knowledge and, from that, to put the required mental processes to work, thereby integrating the methodological dimensions of the knowledge. A teacher of geography must become a professional in the learning of geography, which is to say someone who is at one and the same time capable of targeting the knowledge which needs to be transmitted, of making an epistemological analysis of it and of putting forward a variety of strategies for learning it, in other words, a specialist in the genesis of a given geography and not just in the transmission of results.

1.4 Materials

A certain number of tools are necessary for the trainee teacher, on the one hand for them to be able to appreciate and to analyse the phenomenon of didactical explanation, and on the other, that they may be better prepared to organize these explanations. The knowledge taught and the disciplinary knowledge should be of the same nature and above all, the knowledge taught should not become a caricature of the disciplinary knowledge.

1.4.1 Epistemological tools

According to Piaget (1967), epistemology is

> *"the study of the constitution of legitimate forms of knowledge, the term constitution covering at the same time the conditions of approach to the knowledge and constitutions which are strictly constituted"*

Epistemological thought is necessary for the person who is in training in order to determine the structure of learning, also to develop a conceptual framework, one which takes into account interactions and restructuring and/or the complexity of their first impressions of the discipline, as well as after a didactical training, which is the putting into practice of a cognitive process.

Epistemology is available to the geographer as a point of reference which may be used to indicate what kind of work he or she is involved in, partly responding to any accepted scientific legitimacy, and partly showing how much he or she may be departing from the commonly accepted line. It would be erroneous to believe that the epistemological viewpoint would lead to a well defined norm or collection of norms of scientific practice, at one and the same time it offers very certain anchorage points but also controversial points of view.

One can encourage the trainee to think about the discipline itself and its logic, by making use of a collection of seminal documents, it would be necessary to identify differing papers on the subject of geography as a discipline, to look at these in relation to the evolution of society, the main currents of thinking, the evolution of other disciplines, to rid them of any underlying ideology and to put the stress upon specific disciplinary methodologies.

One needs to lead the trainees towards a recognition of what constitutes disciplinary knowledge, and get them to reflect upon the key concepts of the discipline, as that will lead towards:

- an ability to discriminate between the factual and the notional in a particular case,
- to formulate a problem, for a given subject, in notional terms,
- to collect together, for a given subject, a set of documents which is appropriate to the problem,
- to distinguish the essential notions which are implied by a given subject
- to then set in train a geographical analysis and justification.

As an example, we include the reference grid (Figure 1.3), developed by a team at the INRP (*Institut National de Recherche Pédagogique*), which is about the notion of social space. It

is made up of a complete grid of notions, from which is defined each of the notions or concepts which have been derived.

1.4.2 Didactical tools

Continuing our epistemological reflection upon the structure of geographical knowledge, it is also appropriate to encourage the trainee to make an analysis of the content of geography teaching, to highlight the mainstream strengths of the teaching tradition and those elements of research which are aimed at the university rather than the pedagogic level.
For example, after watching a demonstration of teaching, one can encourage the trainee to formulate the characteristics of the knowledge which had been taught compared with geographical knowledge as such: elements, relationships, interactions, erroneous objects, and objects created by the needs and purposes of the teaching, to discover the discrepancy which results. One can then lead the trainee to identify and to analyse the factors which have brought about this discrepancy: the purposes and problems of geographical knowledge and the knowledge which was taught, the age and level of the pupils, their representations, their preconceptions.

A tool suitable for didactical thinking may consist of transposing the reference grid above into notional objectives (Figure 1.4). Each concept contained in the grid has been sub-divided into a certain number of acts of cognition, representing those objectives which need to be attained, which in turn corresponds to the knowledge which it is proposed to teach. The grid has an operating characteristic; it allows for the definition of learning and evaluation objectives, so as to put in place a progression in the construction of notions, even though the grid has been calibrated according to differing parameters, concepts, relationships and levels of assimilation. The scale of evaluation then becomes the cognitive level attained in relation to defined content. It is by constant referral to the structure of the knowledge that one is going to be able to analyse the intellectual process which the pupil uses in order to construct his or her knowledge, which is a long way from the mere accumulation of knowledge. Bruner (1971) affirms that *"knowing is a process, not a product"*, so, in evaluating knowledge, one always evaluates the product, and never the process.

Notional Referring: Social Space

1. Territory

Space is an area
Situation inside a spatial system and in a period
distance (in kilometers, cost, time)

2. Socio-spatial organization

Functions of space
Differential spaces
each individual has a specific statute at a moment in the society
- each statute corresponds to roles which that individual has in groups
- groups are different according to their differing relations to space

3. Combinations

Social relationships
Geographical relationships between individuals and places and founded on:
- economic relations
- ecological relations
- historical relations
- psychological relations
- legal relations
- ideological relations

4. Spatial scale

Successive degrees (urban district, nation, region, planet)
Encased spaces
Flux, relations
Asymmetrical flux
Socio-spatial group

5. Decision and management

Analysis of decision making
Role of decision makers
Space control

6. Mental map

Subjective space
Space appropriation

7. Spatial dynamics

Actual balance
Transformation, evolution, reproduction
Diachronic and synchronic process
Dysfunctional issues

Figure 1.3 ***Notional referring: social space*** *(after INRP, Histoire et géographie: des didactiques dans tous leurs écarts)*

Notional Goals: Social Space

Territory	area	student identifies and locates a place he (she) fixes the limits of the territory
	distance	he (she) measures distance in kilometers he (she) measures distance in cost, time
	location	he (she)locates a territory inside a spatial system
Socio-spatial organization	functions	student identifies the main function differential
	differential	individual depends on different places
	spaces	student identifies those spaces he (she) names statute of individuals he (she) knows relation between a group and a place
Combinations		
	geographical relations	student analyses: • economic relations • ecological relations • historical relations • psychological relations • legal relations • ideological relations
Spatial scale		
	encased spaces	student analyses encased spaces
	socio spatial spaces	he (she) analyses interrelations (flux) he (she) analyses asymmetrical flux
Spatial challenge		
	space control	student acts according to rule
	decisions	he (she) analyses the role of decision makers he (she) analyses decision process
Spatial dynamics		
	balance	he (she) analyses landscape he (she) analyses diachronic and synchronic process he (she) proceeds to a systemic approach he (she) produces graphic models

Figure 1.4 *Notional goals (after INRP, Histoire et géographie: des didactiques dans tous leurs écarts)*

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2 VISUALISATION OF ENVIRONMENT THROUGH GRAPHICS

Rod Gerber

2.1 Introduction

The study of geography at any level of education involves the investigation of familiar and unfamiliar places and areas. Such investigations may occur through field studies in which either the teacher directs the students' observations towards specific elements in the landscape or the teacher and the students engage in a field research approach that involves their observation, description and explanation of an area to solve a designated problem (Laws 1989, p.105). The direct observational aspect of fieldwork has long been its strength in geographical education as the students and their teachers gather primary data to complete their geographical investigations.

Alternatively, the students and their teachers may complete their investigations using secondary sources of information. These resources may be any written, spoken, graphic or numeric data that contributes to the development of spatial understanding as it relates to the selected geographical issue or problem. In *The Geography Teachers' Guide to the Classroom*, various geographical educators focus on the use of the secondary sources of data through: models (McElroy 1989, pp.95-103); classroom and library research (Murray 1989, pp.85-94); textbooks (Lidstone 1989, pp.225-250) and maps (Gerber & Wilson 1989, pp.197-209). The use of secondary data sources in geographical education constitutes the dominant approach to conducting geography lessons in countries around the world. This generalisation is true for geography teaching and learning in both developed and developing countries.

The extensive use of secondary data in geographical education brings with it several challenges that must be noted if these resources are to be maximised. They include: using data that has been gathered by someone other than the learner; accepting the accuracy of the data; accepting the orientation of the data for the proposed geographical investigation; understanding the biases of the designers/ collectors of the information; being able to interpret the meaning contained in the material; and being able to utilise the information to address the particular geographical issue that is under investigation.

All of these challenges require careful consideration before they can be dismissed as a barrier to effective geographical studies. This chapter cannot address each one of them in the allotted space. Rather, its intention is to focus on one challenge - how learners interpret meaning from one of the main forms of secondary data representation, graphics, and how teachers should promote learners' visualisation of graphic data in their geography lessons.

2.2 Theory

The concept of visualisation of environments using different types of graphics focuses on the interpretation geographically of a range of spatial concepts. MacEachren (1994) defines visualisation in terms of the use of graphics rather than designing graphics. This use may be conceptualised as a three-dimensional space that is defined by three continua: (a) from graphic use that is private (where an individual generates a graphic for his/her own needs) to public (where previously prepared graphics are made available to a wider audience); (b) graphic use that is directed toward revealing unknowns (where the user may begin with only the general goal of looking for something "interesting") versus presenting knowns (where the user is attempting to access particular spatial information); and © graphics' use that has high human-map interaction (where the user can manipulate the graphics in substantive ways) versus low interaction (where the user has limited ability to change the presentation in the graphic). This has led cartographic theorists such as DiBaise (1990) and Taylor (1993) to develop and refine the concept of geographic visualisation as a tool for scientific research which increases the attention of graphics in private data exploration. This approach looks at graphics as research tools that balances attention between visual communication and visual thinking.

Geographic visualisation has been defined by MacEachran (1992,101) as "the use of concrete visual representations - whether on paper or through computer displays or other media - to make spatial contexts and problems visible, so as to engage the most powerful human information-processing abilities, those associated with vision." He demonstrates how visualisation in geographical studies involves the implementation of one or more of the following foci: exploration of graphics to visualise spatial patterns and relationships; the use of different graphics to confirm the existence of such patterns and relationships; the synthesis of selected geographical information about an area in order to construct generalisations about its geography; and the presentation of relevant geographical information in selected graphic forms to communicate the results of the interrogation of this information.

The visualisation of environments through graphics may be considered to be a logical extension of graphic communication (Gerber 1989). This involves a range of cognitive aspects. Blades and Spencer (in press) synthesise the development of spatial representations in largely Piagetian terms for younger children. They note that little research has been conducted to explain why children make certain, and often limited, spatial representational decisions. Cognitive psychology has presented three fruitful areas for investigating the act of visualisation (Peterson 1994). Firstly, there are information processing theories that address the storage of graphic information into iconic memory, short-term visual memory and long-term visual memory (Kosslyn & Koenig 1992). Focus here is on visual pattern recognition through template matching (Humphreys & Bruce 1989), feature detection (Lindsay & Norman 1976) and symbolic description (Bruce & Green 1990). Secondly, there are the studies on mental imagery that have concentrated on: the existence of mental images (e.g. Pylyshyn 1981), the properties of mental images (e.g. Tye 1991) and to establish how they are used in thinking (e.g. Kosslyn & Koenig 1992). Thirdly, there have been theories concerning the processing of moving images. Here, emphasis is placed on Gibson's (1979) theory of "direct" perception in which perception is dependent on a change in the display (e.g. Wanger

et al 1992 on mental processing of computer-generated displays). These cognitive studies have not been characterised by nondualistic investigations in which people's experience with graphics have been investigated through their thoughts, intentions and voices that are expressed in relation to the object of the research, i.e. their visualisation of environments through graphics, i.e. relational studies have not been completed that link the subject and the object of the research in a designated context which mediates these experiences.

Studies of learning about environments have varied from conventional developmental psychological studies about children's environmental knowledge, e.g the use of landmarks as "triggers" for wayfinding (Kuipers 1982) and their wayfinding ability (Golledge 1992). In his synthesis of such research, Blades (1989) emphasised the dearth of research data on learning about environments that have not been experienced directly.

Applied research in geographical education about understanding environments has focused mainly on the use of a single type of graphic, e.g. a map or a photograph, but has not considered the variety of graphics that represent geographical information, viz. maps, photographs, graphs and diagrams. With the increased availability of computer-assisted graphics and the increased popularity of Geographic Information Systems, geographical educators have access to an extensive range of graphics that they may select or prepare for use in their geography classes. What is important in this climate is for these educators to open up the graphic communication experience more readily to that of a multiple-graphic activity that involves the interrelating of data across related graphics rather than a mono-graphics experience that seeks to generalise outcomes from a single representation. By doing so, the learners will be able to engage in a range of cognitive activities that extend from simple geographic descriptions to more complex multi-graphic interpretations.

2.3 Methods

Development of the ability to visualise environments from graphics varies depending on the context in which the learning takes place. Geographers use a wide range of visualisation tools in their investigations. MacEachran (1992, p.100) describes this range to include maps, graphs, sketches, diagrams, photographs and other two-dimensional representations. The challenge for geographical educators is to facilitate the learners to be able to interpret geographical concepts from this range of graphic representations. The integral linkages between the learner, the experience of using graphics to visualise environments and the context in which the learning is taking place, e.g. in the field, in a classroom or in a laboratory, mediate how the person can visualise different types of environments and have they can express such visualisations. Experiential learning is a critical element in the development of this ability. Such learning may be enhanced if the learning experience is self-paced.

An important element in the promotion of visualisation in geography classes is to ensure that the learners are active participants in intellectual tasks that involve a range of graphics. This can be achieved by careful consideration of visualisation in relation to thinking skills. Glatthorn & Baron (1985, pp.49-53) have suggested seven types of thinking that should be considered: diagnosis, hypothesis testing, reflection, insight or the *eureka* phenomenon where solutions come suddenly and with certainty, artistic creation, prediction and decision-

making. Wilson (1989, pp.44-63) has taken these types of thinking and translated them into a sequence for teaching thinking skills in geography. This sequence consists of:

1 Gathering geographical information through listing, grouping and labelling.
2 Gathering geographical information through observation and inference.
3 Generating alternative answers to geographical problems.
4 The clarification of problems.
5 Weighing up the evidence.
6 Refining the evidence.
7 An integrated, structured process for problem-solving in geography.
8 A simplified model for problem-solving.

A careful investigation of this sequence indicates that it cannot be achieved without aspects of visualisation of geographical information being applied at different steps in the sequence. The above-mentioned cognitive tasks are often achieved in geography lessons through the extensive use of graphics and the inherent interpretation of these representations. The learners will make sense of the graphical information through such processes as comprehension, application, analysis, synthesis, interpolation and extrapolation. The following examples are intended to demonstrate how the process of visualisation is implemented in the geography classroom.

2.4 Student material

Three examples of graphic visualisation are included to illustrate the types of geographical education teaching/learning experiences that may be used to maximise its qualities. They consist of:

1 The visualisation of geographical patterns in an imaginary world.
2 The use of maps to visualise a route in a wayfinding activity.
3 The interpretation of environment through photographs.

2.4.1 The visualisation of geographical patterns in an imaginary world

It is quite a challenge for geography students to visualise what an area is like from its representation through a set of graphics. In this exercise, the task is for students to examine the data about the imaginary GRAK world and to visualise some of the distinctive patterns which exist there. Data for this activity were developed as a part of a collaborative research project in Australia and Sweden by Ottosson and Gerber. It consists of the following graphic representations: three coloured thematic maps (population density, birth and death rates, and imports and exports) and four black-and-white graphs (population pyramids for age distribution; linear graphs for GNP per capita; distribution of production for 1965 and 1988 via bar graphs; and major exports for 1965 and 1988 as pie graphs).

Figure 2.1 (a, b) illustrates two of these graphics. The full set of the graphics may be obtained by contacting the author.

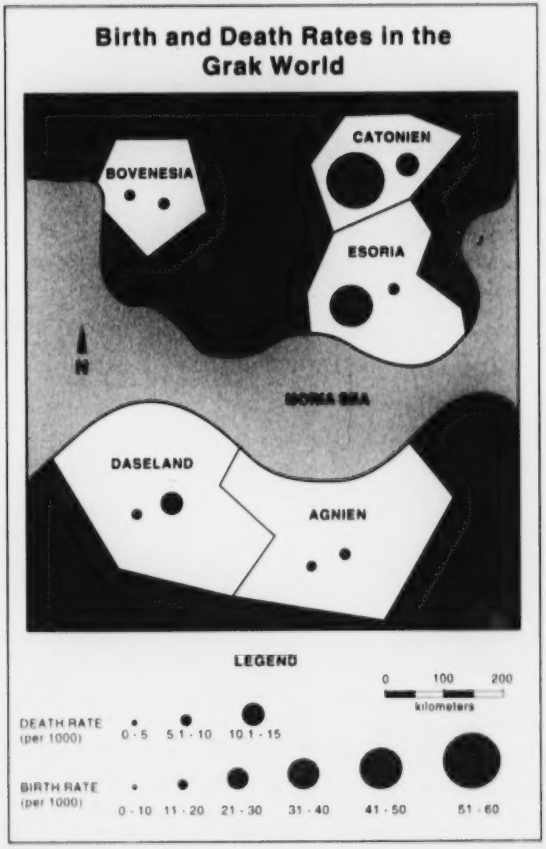

Figure 2.1a One of the seven graphics of the GRAK world (Gerber & Ottosson 1992)

The following activities could form a logical approach to visualising the nature of the GRAK world. The sequence of activities could vary depending on the abilities of the students in the class. Judgements should be made by the teacher on his/her knowledge of the students' experience with graphics. Students should be allowed to make reference to personal or other real-world examples.

1 Organise the students into small working groups of 3-4 people and give each group of students the seven graphics for initial perusal. Allow the students to talk about the GRAK world amongst themselves so that they have the opportunity to pronounce the names of the countries.

2 Ask each group of students to write a paragraph to describe the distribution of the countries in the GRAK world.
3 Have the students work in pairs with each map and graph to describe the pattern of data that has been represented.
4 Then, ask students to choose one country and to make a summary of the data about that country. This summary could consist of a written description of the socio-economic conditions in that country.
5 Ask students to repeat the process for several of the GRAK countries.
6 An alternative strategy could be to ask the students to compare the data for selected countries across particular graphics.
7 Finally, ask the group of students to develop a series of generalisations about the GRAK world. These could focus on such aspects as: the age of the population, trading patterns, the demographic situation and stages of industrial development.

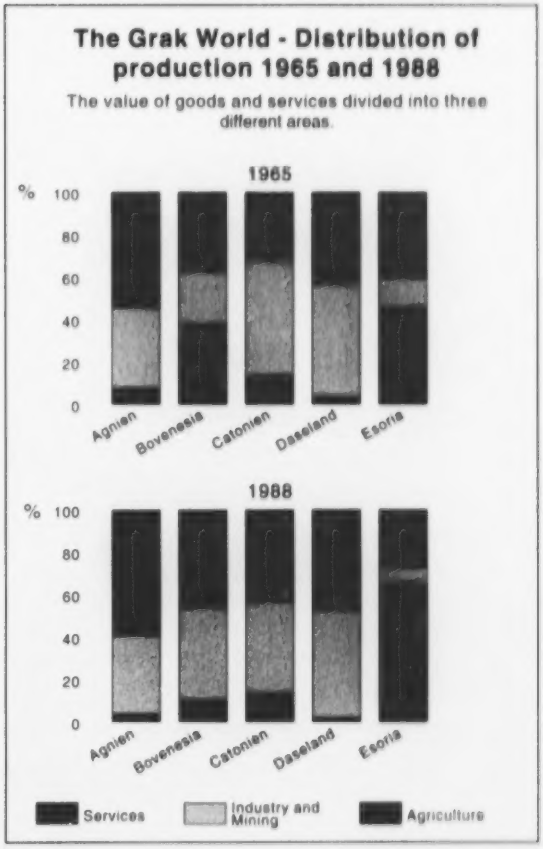

Figure 2.1b One of the seven graphics of the GRAK world (Gerber & Ottosson 1992)

2.4.2 The use of maps to visualise a route in a wayfinding activity

A very useful geographical experience is the finding of one's way around an area for a particular purpose. Such purposes could be to find one's way: around an orienteering course; from home to a leisure park; to go shopping; or around a large regional centre. Sometimes, this activity can be performed from memory as the individuals follow a remembered route. Many times, however, the wayfinding task involves the use of maps to assist the person find his/her way around the chosen or prescribed route. The extent to which visualisation is employed in wayfinding depends on the familiarity of the people with the environment in which they are travelling. If they are unfamiliar with the environment they are likely to use a map of the area as a source for visualisation of the route to be followed. The following wayfinding activity is based on students finding their way around a suburban area.

1 Choose a suburban area from a local street directory and make coloured reproductions of the map. Laminate some of these reproductions to make them waterproof and usable in outdoor settings.
2 Select a group of students aged 10-13 years who are willing to participate in a wayfinding activity and who do not know the area well, i.e. they do not visit the area more than once every two weeks.
3 Prepare a route for the students to follow. For older students it is desirable only to specify the starting and finishing points.
4 Take the students into the school ground where they can sit and contemplate the prescribed or their elected route.
5 Ask each student to describe their route by close reference to the street map. In their descriptions the students should refer to things that they will see along the way and key landmarks that they will use to assist their wayfinding activity. These descriptions could be recorded by: audiotape, written statements or observations by other students.
6 Where the students were able to choose their own routes, a composite map may be developed from their elected routes to indicate the frequency of some routes.
7 If time permits, the teacher may allow the students to complete the actual wayfinding task to find out how different the visualised route was from the actual route taken by each student.

2.4.3 The interpretation of environment through photographs.

Photographs may be used in various ways, depending on their type, for interpreting environments. Vertical and oblique aerial photographs may be used to interpret land use patterns or the structure of a particular environment. Horizontal photographs may be used to interpret visual forms, e.g. architectural structures, and to observe the usage of selected spaces, e.g. the distribution of land use along a street. Therefore, through the development of environmental awareness and appreciation in the investigation of photographs, students are able to visualise the organisation of geographical features. The following example suggests how two contrasting photographs may be used to visualise the urban environment in Singapore.

1 Select two contrasting photographs of an urban area, e.g. Singapore (Figure 2.2).
2 After students (This activity may be used with students at lower secondary level.) have perused the photographs for a few minutes and have discussed the main features as a class group, they are asked to draw formline sketches of each photograph to identify the main elements of the landscape. Each sketch should be labelled carefully.
3 The urban landscape may then be evaluated by conducting an assessment of the buildings in the context of the surrounding urban area, an analysis of the environmental quality of the area and by investigating the students aesthetic awareness of the environment in terms of such qualities as attractiveness, style, proportion, composition, impression and extent of space.
4 The students can then engage in a critical appreciation of the urban environment that results in the writing of a detailed interpretation of the life that could occur in this environment.
5 Photographs of other contrasting environments may then be studied to determine if the students' original visualisations can be transferred to other situations.

2.5 Conclusion

The extent to which learners and teachers in geographical education make effective use of the concept of visualisation in their lessons depends on the extent to which it becomes a focus in interpretative activities in conducting geographical inquiries. The cognitive tasks that are associated with graphic interpretation are invariably linked to visualisation. It is vital that teachers realise the variety of experiences which can be utilised in the name of visualisation and the range of graphics that are required for this to be achieved in geographical education. Technology in the form of computer-generated graphics and the storage of substantial data-sets, especially in the form of GISs, are important bases for visualisation to be implemented throughout geography lessons. Where such technology is not readily available then other secondary data sources, e.g. those in school textbooks, become the tools for use in visualisation tasks. Where possible, learners and teachers should have the opportunity to see at first-hand the differences between the real environment and the represented environment. They then can observe the nature of these differences and appreciate how errors can be made in visualising selected geographical environments.

Figure 2.3 *Two photographs of inner Singapore (Yee Sze Onn 1995)*

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3 CHILDREN'S UNDERSTANDINGS OF PATTERNS AND RELATIONSHIPS IN VISUAL STIMULI: TEACHING FOR MEANING

Margaret Robertson

3.1 Introduction

At the core of geographic education is concern to promote understanding of a number of key concepts including description and location of places, patterns and relationships in distributions of spatial phenomena and the nature of perceived spatial differences. On the surface that task appears to be relatively straight forward. However, our knowledge of the craft of good teaching practice reminds us that the business of promoting relevant and lasting learning is anything but simple. Understanding the contextual setting of classroom learners needs to be the first concern for all teachers of geographic education. Such an approach inevitably creates tensions. Nevertheless, it can be argued that getting this initial diagnosis right is at the essence of good teaching practice. At the heart of focussing on children's understanding of patterns and relationships in visually presented stimuli is an appreciation for the personal views of learners and the possible ways that these may be reflected in the views of other learners in the classroom.

3.2 Theory

Recognition of patterns in visually presented stimuli poses questions related to conceptual knowledge, cognitive strategies and the nature of intelligent behaviour. In mathematics problem solving, for instance, a recent finding by Shama & Dreyfus (1994) suggests that visual or algebraic strategies can produce equally successful outcomes.
In geographic education there is similar interest in cognitive processes. Environmental perceptions (Robertson 1994; Walmsley 1988) are being studied for their influence on the development of mental constructs as diverse as language, number, spatial distribution and density. Therefore the mutual interests of these disciplines in the study of space cognition provides a rich and complementary source of research findings that can potentially serve the educational needs of both cognate areas.

3.2.1 Visual stimuli: meanings and understandings

Recognition of patterns in visually presented materials suggests a process of meaning construction that relies, in part, on spatial cognition. Piagetian theory would advance the idea that the child's understanding reflects a developing ability to interpret space. The first stage is one of "vague awareness" (Golledge & Stimson 1987, p.53). Next there is the stage where the "object is given an existence or location in space and time". Third there is perceptual recognition of parts of the object, and finally, "the attachment of meaning" (p.53) to the object.
Another perspective may be traced to Tolman's (1948) seminal paper on cognitive mapping titled the Cognitive maps in rats and men. In this he explains how schema or mental maps are drawn from information selectively extracted from the environment. As well as providing the groundwork for much of the research on real-world imagery (Downs & Stea 1973) mental maps are seen as a way of representing the complex relationships of information in memory and, as such, have been receiving renewed attention in recent publications on constructivist teaching and learning strategies. Psychological space whether conceived in relation to imaging Euclidean space, rotated or real space is where meanings, manipulations and interpretations exist as mental constructs. Euclidean and real world space may rely on similar internal processes.

3.2.2 A conceptual framework

Theoretical constructs underlying the research reported are summarised in Figure 3.1.
In recent inquiry the focus on the role of everyday learning in problem solving shows a growing acceptance that students experiencing difficulty with formal school learning can be assisted by teaching that takes account of their personal meanings and understandings as well as their stage of development (Resnick 1992). So, the distinction is made between formal and informal learning. The former is viewed in the context of concepts and ideas that rely on strategies for thinking skills that are learned conventions and arguably exclusively within the formal domain. By contrast, everyday experiences in informal settings of home, neighbourhood and social contexts with friends and family are rich sources of learning that shape the context of experience in informal and formal environments (Robertson 1995).

Recognition of the importance of everyday learning is not new for educators but for psychologists the dilemma is how to translate the mental constructs of personal experience into ways that are measurable and transferable. The shift towards research tasks that enable observation of processes is notable in the literature as a means of tackling the problem. Reconstruction of meanings that students attach to a problem in formal learning can provide the key to perceived misunderstandings in conceptual development and inappropriate cognitive strategies. The strength of this holistic approach is that prior assumptions are tested regarding the nature of intelligent behaviour. And, far from viewing one general intelligence or 'g' factor as in the Spearman sense, wider acceptance of there being multiple intelligences (Gardner 1983) provides a broader more imaginative basis for the interpretation of findings. One way of evaluating the conceptual development that underpins responses is through the SOLO Taxon-

omy, an acronym for Structure of Observed Learning Outcomes, (Collis & Biggs 1991). Such information can provide the basis of decisions regarding students' preferred learning styles and corresponding teaching and learning materials.

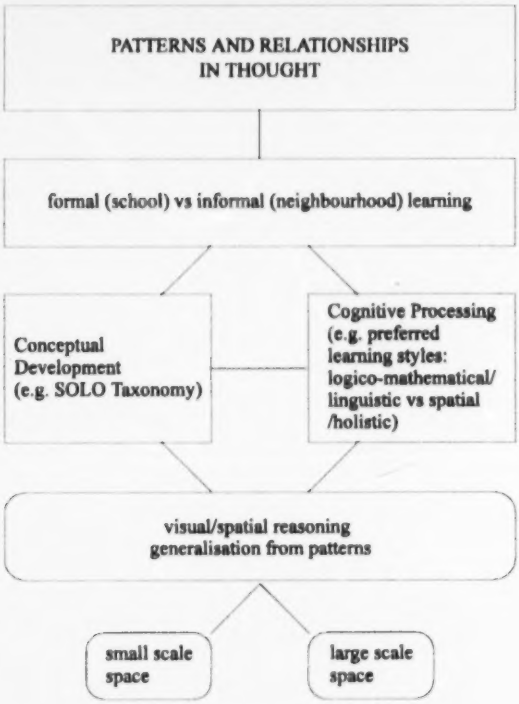

Figure 3.1 Conceptual overview of research in progress

3.3 Ongoing research

In the ongoing research reported in this paper the concepts underlying the conceptual development of patterns and relationships are explored in relation to small scale (Euclidean) and large scale (real world) space with emphasis on open-ended tasks for construct validation and further theorising. This has developed from pilot studies in 1994-5 (Robertson & Taplin 1994; 1995) which focused on mathematical problem solving with particular reference to the expression of generalisations from numerical and spatial patterning tasks. Part of the analysis explored links between students' pattern formation and generalisation and the SOLO Taxonomy. The results, which were based on interview data collected from twelve year old students (twenty males and twenty females) located in two contrasting socio-economic areas, provided some support for the hypothesis that students have preferred methods of problem solving and

that these do not necessarily relate to the ways in which the information is represented. Along with some gender differences in the data there were indications also of shared preferences related to school location, possibly associated with prior knowledge or 'everyday' intelligence (Collis & Biggs 1991). There was also a suggestion of links to the SOLO Taxonomy unistructural-multistructural-relational cycle in students' attempts to recognise generalisations from the patterns they formed (Taplin & Robertson 1995). These preliminary outcomes were encouraging and current investigations are extending the study to a wider range of settings in order to be able to make generalisations from rigorous statistical analyses. The aims of the research are to focus on the relationships between students' preferred problem solving formats with respect to small scale, Euclidean space and large scale 'real' space, age, gender, residential location and cultural background. In brief, when considering patterns and relationships in visual problem solving tasks some of the questions to be asked are:

- Is there one presentation format (model, diagram, verbal, sketch, photograph) which is most commonly preferred by students?
- How does conceptual development, including language knowledge, influence the problem solving strategies used by students? In what ways may this be related to 'novice' to 'expert 'questions as incorporated in the SOLO Taxonomy?
- Are there differences in the ways in which students process small-scale space as opposed to large-scale, real world space?

3.4 Methods applied in the research in progress

In the early research phases questions relating to visual processing and conceptual development of patterns and relationships were designed to be exploratory. Tasks were selected for their potentially data rich responses. They involve a sequence of activities that can be carefully monitored for pattern recognition.

3.4.1 The tasks

Tasks related to Euclidean or small scale space

Three patterns selected for tasks were specifically mathematical. They deal with Euclidean or small scale space and lend themselves to the expression of algebraic generalisations from the patterns. One example of the three patterns is represented in diagrammatic form, in Figure 3.2. Known as the 'path' problem Figure 3.2 shows the first three stages in the pattern. Other problems with similar requests were a 'step' problem and 'match' problem (Robertson & Taplin 1994).

To allow for students' preferences, patterns were presented in cyclic rotation in three formats: concrete modelling using small blocks, diagram, and in both verbal and oral word descriptions. Students were shown the patterns and asked to represent the fifth and tenth terms in the sequence in their preferred ways using blocks, diagrams or telling. They were then asked to describe their predictions of the 100th term and a generalisation for "any term". After

completing all three items, the students were asked which format of representation was more interesting and easier to work in, and their reasons for this decision.

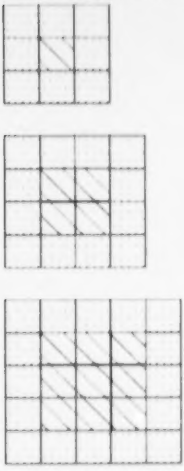

Figure 3.2 Diagrammatic representation of the path problem (Robertson & Taplin 1994)

Tasks related to 'real world' space

A further two patterns related to 'real world space'. In order to simulate tasks similar to those described for mathematical space, geographic locations were selected that have similar patterning relationships in land use distribution. The pattern represented refers to the Land- Rent principle (Haggett 1979) of declining land rents and financial returns with increasing distance from a commercial centre. Using aerial photographs and photosketches, students were required to assess land rents of sites identified in proximity to small urban communities. Finally, based on the patterns observed, they were asked to identify relationships suitable for generalising to other real world locations. For tasks related to 'real world' space the central problem of seeking a pattern was similar to the 'small scale' tasks.

Sampling

Participating in this ongoing research are six schools within Australia which have been selected to highlight neighbourhood differences in socio-economic variables such as employment levels, parental expectations and education levels, levels of public and private housing and accessibility to services, and rural versus urban differences. In year one of the study cross grade data have been collected in individual and semi-structured interviews using observation and Teachback (Pask 1976) strategies. The aim is to have a longitudinal study based on three consecutive years of data collection. Each interview was of approximately twenty minutes duration and with samples of year 7, twelve year olds, and year 10, fifteen year olds. Twenty students (ten male and ten female) were identified from each Grade by random computer sampling making a total sample of 240 students. Another dimension to this research is a parallel study in Hong Kong which will be used to explore links between culture and preferred problem solving format.

3.5 Preliminary results and messages for teaching

Analyses are still in progress. However, early trends present some interesting directions in the data that raise questions for the development of relevant teaching materials (Robertson & Taplin 1994, 1995, Taplin & Robertson 1995).

3.5.1 Concrete modelling preference

With respect to tasks related to small scale space students show a preference for concrete modelling of visualisation problems regardless of format in which the problem is presented. In relation to two small scale problems preliminary data analysis (see Table 2) reveals a shift to verbal reasoning for fifteen year olds in both tasks but, perhaps surprisingly, a large group preference remaining for concrete formats.

Table 1 Summary data for path problem (Task 1) and step problem (Task 2) by grade

	Twelve Year Olds		Fifteen Year Olds	
Strategies	Task 1		Task 1	
	freq.	perc.	freq.	perc.
Concrete	24	53	16	39
Diagram	4	9	2	5
Mixed Mode	9	20	6	15
Verbal	8	18	17	41
	n = 45	100	n = 41	100
Strategies	Task 2		Task 2	
	freq.	perc.	freq.	perc.
Concrete	33	73	23	56
Diagram	5	11	1	2
Mixed Mode	4	9	4	10
Verbal	3	7	13	32
	n = 45	100	n = 41	100

Verbalisation appears to 'take over' once the problem is 'grasped'. This is usually independent of any judgment we may impose on accuracy of the solution. The solution and the strategy employed are specific to the student and are likely to reflect their prior learning and knowl-

edge. When asked to explain their preferences, reasons given for preferring the concrete mode included:

> *The model, because you can see it. Drawing is OK it is on squared paper. The description was harder to picture in my head before it went away. (girl)*
>
> *It's more fun working with shapes (girl).*
>
> *You can see if you forget the description or can't do it (boy).*

However, when responses were examined more critically in terms of accuracy exclusive use of concrete modelling strategies did not appear to lead to successful outcomes. All students who arrived at the 'right' rule in both year groups did so via a verbalisation strategy. In Piagetian terms these students had passed the vague awareness stage apparent in the concrete responses and had appeared to have formed mental constructs that facilitated appropriate meanings. In the sequence towards understanding the message from these responses appears to be that concrete three dimensional formats are important from initial engagement in the problem but that learning for meaning requires a transition to higher order thinking processes using both linguistic and mathematical symbolism.

For teachers one response might be to seek teaching materials that use a variety of pictorial and graphical representations of ideas as well as verbal descriptions. Such varied requirements in cognitive skills is more likely to accommodate the individual needs of students and may assist earlier understanding of complex concepts.

3.5.2 'Land Rent' responses

Like the small scale space problems coded responses to problems related to landscape photographs and photosketches indicate varying levels of understanding. At the simplest level students in both year groups sought to find a linear, two dimensional, arithmetic relationship (Robertson & Taplin 1995). More expansive responses made use of other information provided in the representations and were able to link 'Land Rents' to geographically relevant issues such as accessibility and transport availability. However, it is debatable whether these responses related to formal learning. It was evident in the responses that everyday experience was an important influence. Such prior knowledge is illustrated in the responses of some students who identified land rent with issues related to public housing such as 'how nice the house is', or 'does it have a view?'.

The conceptual understanding of the language is highlighted in these responses and casts a warning to teachers of the dangers of assuming understanding without exploration of associated ideas held by students. The lesson must be that for effective teaching an assessment of known and related constructs will be a valuable starting point for teaching 'new' theoretical concepts. Concept mapping is a relevant teaching tool to reconstruct meanings as are flexible open ended learning challenges.

3.5.3 Gender differences

In one school the response formats of boys and girls to the tasks presented have been fairly evenly distributed. However, in another school, the data show a tendency for more boys than girls to choose concrete modelling for responding and for more girls than boys to give verbal responses. Rather than any fundamental differences in abilities, perceived differences in motivation of the boys and girls was offered as a possible explanation by the teacher of the second group of students. Again, this shows the need for a wide a range of cognitive skills to be challenged in learning materials. Student-centred activities with self- paced activities offers one solution.

3.5.4 An 'expert' teacher's solution

One 'expert' teacher identified during the research describes her way of teaching spatial concepts as story building based on visualisation of known neighbourhood landmarks. Using the imaging skills of the students she can base related concepts around known and familiar objects that are part of their world view. Once the students are engaged in the familiar the teacher next provides the 'scaffolding' to extend their current understandings in the formal sense of the curriculum. "Expert" teachers incorporate new knowledge about their students such as that described, with a variety of contextually specific strategies. A signal for the next step in the research path described may well be to look more closely at the strategies that recognised 'expert' teachers use.

3.6 Summary

Good teaching is built on the quality of the relationship developed between students and their teacher. The constructivist approach to teaching relies on the knowledge gained of students meanings. Research indicates that 'everyday' intelligence contributes to the readiness that the students have for formal, classroom learning. Often the experience from home and the neighbourhood community is based on developing world views from visual- spatial experiences. This may be best accessed through real images that can be the basis for long term interest and engagement in 'deep' learning for understanding in geographic education. Informed listening is the tool that distinguishes good geographic education from just another learning experience.

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4 A CONSTRUCTIVIST APPROACH TO CHILDREN'S UNDERSTANDING OF THEMATIC MAPS

Patrick Wiegand

4.1 Introduction

Economic mapping in atlases represents a high level of abstraction. Beneath the apparent objectivity of maps are a series of decisions and generalisations made by the cartographer, involving simplification and generalisation, of which the (young) user is often unaware (Wiegand 1991). Consider, for example, Figure 4.1a which shows the location of some engineering factories.

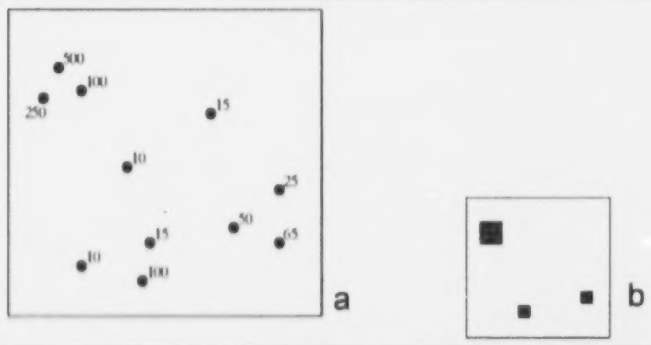

Figure 4.1 *a* *Location of some engineering factories (after Wiegand & Carr 1993, p. 36)*
b *Possible smaller scale generalisation of the information shown in 4.1a*

Next to each factory is a number showing how many people are employed. Suppose you wish to make a map of this distribution using symbols of different sizes to show the relative importance of engineering in different places. Perhaps you choose a large symbol to show factories with 100 or more employees and a small symbol to show those with less than 100 employees. However, now suppose that this set of data forms only part of a much larger quantity of information which is to be mapped at a smaller scale in order to present an overall view of the economy of the entire country. This engineering data must be set alongside data about other industries such as clothing, motor vehicles, food processing, power generation and so on. Perhaps in this context you can only allow one large and two small symbols for engineering. Where are the symbols to be placed? The (fairly typical) solution adopted in Figure 4.1b has been to simplify the distribution by placing a symbol in the mean centre of each of three groups of factories and omitting two of the smallest factories altogether.

Selecting symbols and locating them on a map is a complex cartographic task. especially when several economic activities are to be treated. Notice incidentally, that the task is even more complex when data on separate industries is not available on a common base. The relative importance of one industry might for example be determined by weight of its output, of another by its value, yet another by the number of employees, still another by the number of items manufactured. Balancing symbols of differering sizes between these measures of relative importance is therefore tricky. The resultant map may require considerable care in interpretation, especially if the basis of compilation is not made explicit. Absence of a symbol, for example, may not mean absence of the phenomenon, merely that it exists below the threshold for inclusion.

Cartographic decisions such as these are common in the production of small scale economic maps where point symbols are used to represent economic activity. Many atlases used in schools contain such maps (see for example those from European publishers such as Oxford University Press, Westermann, Hachette, Agostini and Wolters-Noordhoff) and it is to be assumed that teachers make use of them although little evidence as to how this actually happens in the classroom has appeared in the literature.

Helping pupils to look at maps with some criticality (especially small scale maps, because of their reductionism) is an important aspect of geography teaching. A useful starting point is to ascertain what perspectives the pupils themselves bring to bear on the map making task.

4.2 Theory

4.2.1 The constructivist approach

The constructivist position is one which has become prominent in science teaching but has yet to make much impact on geographical education. Although there are different traditions within constructivism, they share the view that knowledge is not transmitted directly from one knower to another, but is actively built up by the learner (Driver et al. 1994). A further issue is the underlying nature of scientific knowledge. Science does not itself consist of natural phenomena but rather the constructs which are advanced by the scientific community to interpret nature. Thus scientific knowledge is both symbolic and socially negotiated. Learning science is a matter therefore of individual activity in an attempt to understand the concepts of science, as well as a socialising process by which individuals are introduced to a culture by more skilled members. There are parallels here with making and using maps.

Cartography consists of constructs (maps and their sign systems) which are socially created and subject to recognised rules. It is taken for granted that certain phenomena are selected from the real world and represented on maps in ways that are generally widely agreed. The discipline is organised by notions such as scale, projections and symbology. Geographical education often consists of transmitting these principles (for example teaching how agreed symbols, such as contours, work) but less often of a process of interaction with the cultural norms of the discipline. It is suggested in this chapter that learners would benefit by 'being cartographers' and engaging themselves in, for example, the messy business of data reduction

and symbol location. The role of the teacher would be to provide supporting dialogue for pupils as they construct the symbolic meanings of maps for themselves as well as becoming inducted into the culture of cartography. Such supporting dialogue is what Bruner (1986) calls 'scaffolding'.

4.2.2 Making and understanding thematic maps

There is insufficient space here for a full review of the literature of cartographic techniques and users' interpretation of thematic maps and so attention will be drawn only to some of the more significant issues. The assumption, for example, that maps provide information 'at a glance' deserves serious consideration (Muehrcke 1974). Maps do not tell the whole truth and, indeed, some of them tell lies (Monmonier 1991). It can be argued that the smaller the scale of the map, the greater the lies that are told, because of the evident consequences of generalisation at small scales. The theory and professional practice of selection, simplification and omission of less significant detail has been described elsewhere by, for example, Keates (1989), but we know little about the extent to which map users are aware of the effects of this. It seems clear that children make substantial gains in their competence and performance in cartographic language from the later primary to early secondary years and that this development appears to vary according to different types of cartographic sign (Gerber 1981), but such work more frequently takes the cartographic process involved as given rather than open to question. Keates (1982) has suggested that some attempt to explain how cartographic signs work and provide an account of the effects of scale and generalisation might form a more substantial basis for the development of map interpretation skills. School materials for teaching such skills have been criticised for being inadequate and imbalanced (see for example, Sandford 1983) but very few appear to ever to have dealt with insights into the decision structures that underpin 'realisation' of the finished map.

4.3 Methods

This section describes some simple map making tasks which will be referred to in the student material section and form the basis of a suggested activity for trainee teachers to discover more about how school children construe the nature of thematic maps. The provisional results of some empirical work (to be reported in full elsewhere) are also described.

The aim of the map-making tasks is to replicate a common decision-making process in cartography - that of placing generalised point symbols on a map to represent a particular distribution. Pupils are provided with a series of maps of an imaginary island. Each map shows, by a distribution of dots, the location of some animals. A perspex overlay is placed over each dot distribution and pupils are asked to make a second map, this time using animal pictograms, to show where the animals are. The overlay allows them to place the pictogram(s) directly over the pattern of dots. During the task, children are prompted for their reasons for locating the pictograms in the positions chosen and the teacher attempts to 'scaffold' their understanding of point symbology.

Figure 4.2 *Simple dot distributions of animals*
a: birds b: cows c: horses

Figure 4.2 (a-c) shows three simple dot distributions of imaginary animals presented in turn for mapping by a pilot sample of upper primary and lower secondary school pupils in Leeds, England. There are 15 animals in each case but the distributions are markedly different. Figure 4.2 (a) represents a single cluster of 'birds' on the island. The children were asked to locate a small bird pictogram on their overlay map to show the location of the birds. If they felt that one pictogram was insufficient, they were provided with more. This process was repeated for the distribution of 'cows' (Figure 4.2b, showing a major cluster and a minor cluster of animals) and 'horses' (Figure 4.2c, showing a more widespread, scattered distribution of animals over the whole island).

In a further task, the children were presented with composite overlays. Figure 4.3a is a straightforward composite of the three previous dot distributions. There are, as before, 15 of each type of animal. Figures 4.3b and 4.3c show similar dot distributions but this time the proportions and locations of the dots are altered to show 5, 10 and 15 of each animal respectively. To make a pictogram map of each of these composite distributions the children were provided with a palette of animal symbols.

The results of the Leeds investigation showed the children performing the task at a number of (roughly hierarchical) levels.

1 Symbols do not correspond to dots

A few children failed to understand the nature of the task. Typical responses from children in this group were that 'the symbol mustn't cover up the dots'. They had failed to see that the point of the exercise was to make a separate, generalised map whereby the pictogram(s) would stand for the overall distribution of individual dots shown on the base map.

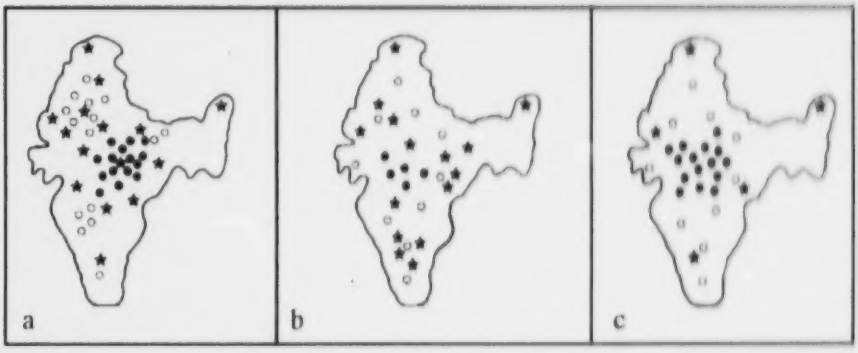

Figure 4.3. *Complex dot distributions of animals.*
a: 15 birds, 15 cows, 15 horses
b: 5 birds, 10 cows, 15 horses
c: 15 birds, 10 cows, 5 horses

2 Symbols located according to one-to-one correspondence
Some children could not accept that a pictogram symbol could stand for several or even all of the dots on the base map. These children often stated that 'You have to show where each one is'.

3 Symbols located according to alternative criteria
Some, especially younger, children placed the symbols according to fanciful or imaginary characteristics of the island or the animals. When placing the pictogram for cows, for example, many children placed it not over the largest cluster of dots but adjacent to one of the peripheral, isolated dots because 'the cow wants to be near a friend' or 'it wants to be near the water'. The pictograms were not used to summarise the distribution but to participate in the story of the map.

4 Symbols located with reference to areal extent only
Most children placed pictograms so that they showed the broad area or 'outer limits' of each animal's distribution. 'Birds' for example were commonly shown on the maps by one pictogram representing the entire cluster, whereas the 'horses' would be shown by four or five symbols marking the outer edge of the area occupied by horses. These uneven numbers of pictograms were also used on the first composite map (Figure 4.3a), despite there being in this instance, the same number of each type of animal.

5 Symbols located with reference to area and density of distribution
Only a few children used their pictogram symbols on the composite maps to reflect both the area covered by the dots and the relative numbers of each animal. The most cartographically competent maps showed the general trend of animal distribution. Isolated occurrences were confidently ignored and the resultant maps had balance and proportion.

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The proportions of pupils functioning at each of these levels changed from primary through to secondary school. Nevertheless the evidence suggests that few lower secondary school pupils appreciate that located map symbols may be related to relative numbers or density of phenomena as well as to their spatial distribution.

A similar procedure was then followed with a sample of secondary school pupils for maps which showed point distributions, each having associated numerical values (i.e. similar to that shown in Figure 4.1). These points and figures were presented, as in the Introduction above, as factory sites and the number of workers in each factory. The pupils were asked to allocate symbols to the distribution using a palette of large and small symbols.

Again, this task was accomplished at several, similar levels:

1 symbols were used to mark out the maximum territorial extent of the distribution, irrespective of the numerical value of each point
2 large symbols were placed on the largest values, small symbols were placed on the smallest values of all (i.e. in preference to medium sized values)
3 large symbols were placed on large values, small symbols were placed on medium sized values and the smallest values of all were ignored
4 large symbols were placed on perceived major 'groupings' of the largest values, small symbols placed on lesser groupings of lower value. Isolated cases of low value were ignored. The overall balance of symbols were proportional to each other.

The work quoted above appears to reveal that when faced with the task of 'being a cartographer', children see a number of different solutions to the task of mapping and these solutions shed some light on their misunderstanding of the way thematic maps show information. Some children have little idea of how to go about the task, others interpret it too literally and only a few see that there is a process of generalisation involved, requiring some information to be sacrificed in the interests of balance and aesthetic appeal of the finished map.

This approach of children attempting to articulate their own solution to a cartographic problem is presented here as a possible basis for trainee teachers' exploration of the notions held by pupils about map conventions.

In current UK secondary teacher training arrangements a common pattern of school experience is for student teachers to spend a period of time in serial visits to the school (perhaps one or two days per week for ten weeks) before undertaking a block of teaching practice. Such serial visits are an opportunity for student teachers to investigate how pupils construe subject content. Work is often undertaken with individuals or small groups in order to explore pupil understanding and to enable the student teachers to 'start where their pupils are'. It is in such a context that the student materials in section 4 below are presented. The materials consist of a set of instructions that require the student teacher to prepare an investigation. Some flexibility is allowed, bearing in mind the opportunities and constraints in each school. The general approach could be adapted for use with larger groups by, for example, presenting the materials as overhead projector overlays.

4.4 Student material

These instructions are to enable you to ascertain typical understandings (and misunderstandings) that school pupils may have of thematic maps.

4.4.1 Initial map interpretation activity

This activity is designed to explore the meanings that pupils derive from a thematic map.

Select an economic map from an atlas. It is preferable that the map shows an area with which the children are familiar (most probably the home area). The map should show a range of located point symbols that represent economic activity.

First, review for yourself how the information is represented on the map. Are the symbols iconic (picture-like) or abstract (e g. squares and circles)? What do the colours mean on the map? Is there a legend on the same page? Is it adequate in its description of signs and symbols? Can you predict any potential misunderstandings by pupils?

Follow a questioning sequence based on the bullet points below with the class, group or individual pupils with whom you are working. Record your answers in whatever way you can. You may wish, for example, to use a tape recorder or write notes after the event.

- Have you seen a map like this before?
- Can you say where it is?
- Tell me what the map shows.
- Tell me as much as you can about . . . (name a place).
- (Refer to the legend). What does this symbol stand for?
- (If symbols are shown at different sizes) Why are some symbols larger than others?
- (Refer to a particular symbol at a particular location) What would that look like if you went there? (You may like to ask some pupils to draw a picture of what it looks like).

As soon as possible after your discussion, write notes on the pupils' comments. Did they refer to the legend before you drew attention to it? (It is common for people to guess at symbol meanings rather than use the legend, especially if the symbols are picture-like). Even using the legend, were there misunderstandings of the meaning of symbols? (It is common, for example, for people to interpret 'food and drink' as a text line in a legend as 'a place where you can eat' rather than 'a place where food and drink are processed'). Did the pupils make scale errors? (It is common for people not to recognise that small scale economic maps represent a very large area of the Earth's surface).

4.4.2 Making meaning from maps

Make several copies of dot distributions similar to those shown in Figure 4.2. You will need some copies for the pupils to work with and some copies on which you can record their 'maps'. Choose a set of items familiar to the pupils, perhaps animals or factories. Explain that the dots represent the location of those items. Make some pictograms that match the items chosen by drawing outlines on some acetate sheet.

Do this investigation with a number of individuals or pairs of pupils. Start with a distribution similar to Figure 4.2a. Ask the pupils to show where they would put a single pictogram symbol. Ask if further symbols are needed. Record the finished 'maps'.

Now present the remaining distributions in turn (i.e. those similar to Figures 4.2 (a) and (b) and 4.3 (a-c). Ask the pupils to show where they would put symbols. Record each of the finished 'maps'.

Whilst the pupils are solving the cartographic problems try to ascertain the basis on which they are locating symbols. You may find it helpful to use some of the following opening dialogue strategies:

- How many dots does this symbol represent?
- Does every dot need a symbol?
- Do you need more symbols for a dispersed distribution that for a compact distribution?
- Is it possible for this symbol to stand for a group of dots? If so, show me a suitable group of dots that could be represented by one symbol.

Now use a dot distribution with numbers (as Figure 4.1a). Repeat the process above. You may find it helpful to ask children to draw lines around clusters of dots and numbers that are to be represented by symbols. Do they all 'see' the dots resolving themselves into the same clusters? From this starting point you can extend the exercise to include points and numbers of several data sets (i.e. different types of factories and different measures of relative size). As the task becomes more complex, the potential for exploring pupils' engagement with making meaning from maps becomes richer. Ask them to compare symbol maps made by their peers. Are some better than others? If so, why?

4.4.3 Second map interpretation activity

Choose a similar economic map to the one used in activity 4.1 above. Perhaps it's the same map style but of a different area.
Follow a questioning sequence based on the following bullet points:

- (Refer to a particular area on the map) Tell me about area X. What is the economy like?
- How do you think the map was made? Can you list steps in its development?

- Can you suggest some things that the map doesn't show?
- How did the map makers decide where to put the symbols?
- Are there any clues as to the criteria used for the location of symbols (such as the size threshold for individual locations)
- When was the map made? What might have happened since?
- Can we formulate some advice for map readers using this map?

The expectation at this point would be that pupils are able to reflect on small scale economic maps with a greater degree of criticality than hitherto.

4.4.4 Further activity

You may like to try to devise an activity like 4.2 above to investigate pupil's understanding of choropleth maps.

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5 IDEOLOGICAL PROPAGANDA IN MAPS AND GEOGRAPHICAL EDUCATION

Yoram Bar-Gal

5.1 Introduction

Society's systems of socialization, including primarily the educational system, constitute a linking factor between knowledge and ideology. According to Foucault (1980), ideology makes use of education for the purpose of survival, continuity and perpetuation of values. From the behavioral point of view, there is an assumption that the creation of a feeling of territorial belonging, which helps the individual locate himself in the world, is very important for the shaping of an individual's personality and world view (Muir & Paddison 1981). From society's perspective, states saw a need to include geography as a subject in the schools when nationalism flourished in Europe in the 19th century. This aided the achievement of nationalism's political goals (Capel 1981). It seems, therefore, that geography as taught in schools plays an important role in shaping the attitude towards territory and nationalism, because geography links the ideas which Taylor calls "the basic trilogy: territory-state-nation," (1985, p. 195). The devices and subjects for increasing man's identification with territory are to be found in the area of "territorial socialization" (as defined by Duchacek 1970), and these are expressed in the products which society produces and markets in the educational system and in the media.

In this chapter, we first examine some general ideas in an attempt to analyze the way in which cartographic devices are created and used for the purposes of territorial socialization. After this discussion on cartography, propaganda and ideology, we will take several examples from Israel. The choice of these examples is not coincidental. Rather, the cases were chosen for their ability to demonstrate boldly the conclusions of the theoretical analysis. Moreover, we can learn from them about the possible relationships which could exist between cartography and geographical education.

This matter seems increasingly important in modern times, when educational systems use more and more visual representations: pictures, video, films, and various diagrams. These representations, with their sophisticated editing, allow for the relaying of meanings which serve the purposes of the representations' creators. It seems that in the literature which deals with education and geography, not enough emphasis has been placed on this issue (see for example, Pepper 1987, Fien & Gerber 1986). It is possible that one of the reasons for this is that geographical education has not adopted the critical lines of thinking from radical geography which developed in the 1970s and 1980s (Lambert 1992).

5.2 Cartography, political messages and geographical education

Some perceive schools as a tool for political socialization, which is carried out in the curricula and in the language used in them (Edwards 1990). Primary schools teach what Bernstein (1975) called the "formal language" that reflects the ruling power. Cartographic representations must be treated as language, to which both youth and adults are exposed. The way in which these representations are presented demonstrates Thompson's ideas (1987) about the relationship between language and ideology. He claims that these relationships contain clear-cut subjective and ideological distortions; in other words, they contain hidden propaganda.

The idea that maps are subjective is not new. Cartographers refer to maps as a human-subjective product. Some view cartography as an "industry, which packages and markets spatial knowledge" (Sorrell 1981) or as a communicative device with human distortions (Wood 1972). The literature which deals with the teaching of geography does not ignore the problem of presenting three-dimensional reality on two-dimensional paper. However, usually the discussion raises technical questions which are linked to this presentation, such has the various perspectives, or methods to represent altitude. Those who write in this spirit begin with the assumption that maps represent a model of reality, and therefore the main emphasis in the educational system must be on studying the graphic signs and analysis of the maps. Another subject which is very common in the literature about maps in the field of geographical education has to do with children's ability to simplify, and in teaching the signs which appear on a map: understanding scale, presentation of altitude, and so on. Thus, for example, Boardman states that the educational system must teach students to internalize the following four mapping principles: direction, location, scale, symbolism (Boardman 1985, p. 129), but he does not emphasize enough the comprehension of the cartographer's selectivity and distortion. Boardman also claims (1983) that maps must be understood as models of communication, but he underemphasizes the significance of the mapmaker's intentional selectivity. From this point of view, Robinson's criticism of 1967 has not been answered. He claimed that schools do not educate enough for comprehension of the significance of maps, and that geographic education does not provide adults with the understanding of what a map is: "What they don't tell him, or, even more important, what they seem to say that actually isn't so".

The educational system continues, therefore, to present maps as miniature models of reality, and less often emphasizes that these maps are distorted models, which sometimes can "lie," and contain items that are completely different from reality. Gerber (1992) also comments on the gap which exists between the progress of cartography and geography on the one hand, and the teaching of maps in schools on the other hand. He claims that schools do not place enough emphasis in teaching critical thinking concerning maps and their subjectiveness. It seems that schools' geographic education does not emphasize that the maps presented in the textbooks, atlases, or media are shaped by ideology or in other words, they are subject to the influence of economic and political power. Ideological power like this leads to the creation of hidden propaganda in the teaching materials, because propaganda is one of the main means of socialization. With the help of propaganda, the reigning political power attempts to put forward its own opinions, to justify its ways and to document its activities. Political propa-

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ganda may deal with various subjects, including the subject of territory, and thus contributes to the needs of political socialization.

There is a claim that modern society and its political and economic institutions cannot exist without propaganda and advertising, which fill an important function not just for the producer but also for the consumer; in other words, for everyone. Institutions and organizations will not be able to function without using advertising and propaganda (Ellul 1965). Between the accepted means of propaganda one can find also those which use geographical expressions (Burnett 1985; Hall 1981). The political ruling power is not the only body which uses propaganda and advertising of a geographical nature, replete with statistical presentations; other bodies, including commercial companies, make use of maps to create their own "truth," as Monmonier (1991) and Wood (1993) have shown.

We shall now briefly discuss map propaganda. The attention to the varied use of cartography for the purposes of propaganda has been brought up in the scientific literature during the Second World War, following the Germans' massive use of maps -- despite the fact that by the end of the First World War Karl Haushofer had used geography for the purposes of German propaganda (see Monmonier & Schnell 1988, p. 215). Speier (1941, p. 313) writes that German propagandists discovered the advantages of cartography in the re-representation of reality: for them, the most important goal in producing maps was their efficiency in providing communication between the ruler and the masses. This author discusses the various graphic and technical means used in the maps which were created for the sake of propaganda: color, dimension, page or text design. He also cites the incredible importance which the cartographers who worked for German propaganda associated with the design of agreed-upon signs to mark borders on maps.

One year later, Wright (1942) stated specifically that there is no such thing as an objective map. A map is not "divine truth," it is not realistic. He emphasizes that "If mapmakers are human, so too are map users". Wright calls upon us to understand that in the process of creating and deciphering maps, many considerations are involved, including considerations of political propaganda. We must not see maps as reality, but rather, as the reflection of reality in the eyes of the cartographer. After the Second World War, Boggs (1947) summarized these issues, by inventing the expression "cartohypnosis": he claims that during wars, people are hypnotized by maps, they accept them and unjudgementally accept the facts which the maps present.

About thirty years later Ager (1978) wrote an article on the subject of propaganda and graphic distortions in maps, in which he attacked the various ways in which maps are used by propagandists and cartographers. He insists that the following items serve to manipulate in maps: selection, symbolization, provocation, color and shading, typography, statistical data, and configuration of maps. Each of these items is exposed to the manipulative ability of the mapmaker, without the map reader knowing that deliberately deceptive use has been made of the items. The maps are likely to lead to distorted interpretation of reality, even by individuals who are trained in map reading. This is particularly noticeable in maps which are created for political propaganda purposes or commercial advertising, in which the distortions are deliberate, and tend to exaggerate. Therefore, the situation may arise in which most individuals, who are not aware of the problems associated with the presentation of reality in map format, will view reality as it "appears" on the map.

5.3 Propaganda in maps and education in Israel

We will now try to illustrate the ideas discussed above, in an analysis of the Israeli case, in which students are exposed, as in any other state, to cartographic representations which contain ideological messages, otherwise known as revealed or hidden propaganda. One must remember that territorial socialization in the Israeli context, was continual for thousands of years, ever since the people of Israel went into exile. The longings for Zion - for Eretz Yisrael - were the prayers of the people, and as such, were expressed in religious ritual and in the holidays which the Jewish people celebrated in exile. Until the formation of the modern Zionist movement at the end of the 19th century, the longings were for the idea of a heavenly territory rather than for a physical entity. Nonetheless, even by the Renaissance period, maps of the Land of Israel appeared in Europe in religious ritual Jewish texts. Their appearance represents an attempt to give people and children geographical pictures of the theological, territorial concept of "Eretz Yisrael," or the Land of Israel (see, for example, Brodsky 1992; 1993).

In modern times, there is no doubt that the physical image of Israel was the basis for the modern socialization system regarding territory for the Jewish people, a process which has matured since the Zionist movement was founded. The Zionist movement carried the flag of territorial education until the foundation of the State of Israel in 1948. One must suppose that familiarity with the image of the map of Israel, as the Zionist movement's target country for immigration, and the map of the homeland of the citizens of the state of Israel, was one of the important means of territorial education. The map creators ("the writers," as in textbooks or in the press) transfer to their readers, consciously and unconsciously, social values and various ideological perceptions. The writers assume that the students, or "readers," will develop a recognition of the territory represented in the map, and will see it as a representation of reality. In this way, the map "writers" transmit Zionist ideology to the next generation.

In order to trace the ideological influence of the maps to which the students were exposed, we have chosen several examples from two different fields, firstly from textbooks and atlases and secondly from daily newspapers. Each example will be presented separately and then we will conduct an extensive discussion on the connection between maps, propaganda, and the educational system.

5.3.1 Maps in geography textbooks

Zionism, as a modern nationalist movement, set as its goal the return of the people of Israel to their land, founded educational institutions, and created propaganda to convince the Jews to immigrate to Israel and settle there. These institutions created and circulated the map of the land of Israel in various publications, including the geography textbooks which were studied throughout the Jewish Diaspora (Bar-Gal 1993a). Many textbooks were published concerning the geography of the Land of Israel, in which various maps appeared alongside the textual description of the land, and its physical and human characteristics. A survey of textbooks which were written in this period concerning the Land of Israel shows the relation-

ship between Zionist ideology and its expression in the representations that appear in these books, mainly on the subject of the borders of the Land of Israel (Bar-Gal 1993b).

The creation of a sovereign state in 1948 gave the Zionist ideology political power and resources which it did not possess previously. The establishment of the state gave the territory borders and a particular spatial shape, which were supposed to become a known symbol, accepted by the state's citizens. The official name of this territory is the "State of Israel", and it is located within the borders which were determined by the cease-fire agreements after the 1948 War for Independence, known as the "Green Line".

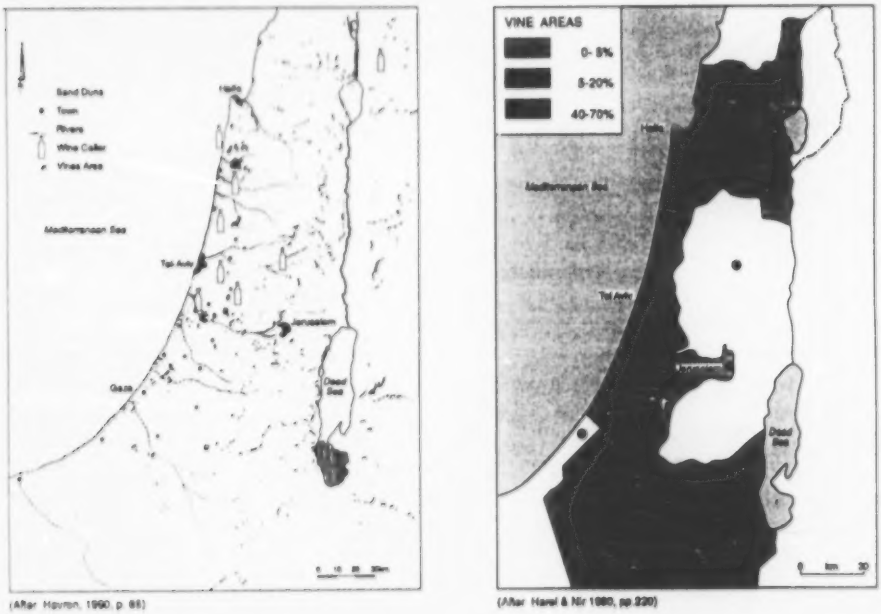
Even after the state was established, the geographical profession continued to be an important tool for territorial education within Israeli society. In the centralized educational system of Israel, textbooks go through a process of formal authorization, and the degree of their appropriateness for use in schools is checked. The relationship between ideology and the graphic representations of territory that appear in some of these texts may be illustrated in the textbooks which have been widely distributed for many years within the educational system. It is important to note that considerable cartographic and scientific effort was invested in these books, as well as painstaking editing. However, one can see that there are cases in which ideology is unconsciously inserted into the maps.

In most textbooks concerning the geography of the Land of Israel, confusion and inconsistency concerning the borders of the state abound. As a result, it is possible to see the strange phenomena in the mapping of geographic issues in the Land of Israel. For example, if we take the simple geographic element of the area of vineyards in the Land of Israel, in various books we will see different treatments of this matter, both in terms of their prevalence and in terms of the borders of the state. In Hevron's book (1990), the borders of the state do not appear at all (Figure 5.1a). On the other hand, in Harel & Nir's book (1991), strange borders are drawn: the "Green Line" (1949 border) and the Golan Heights border (1974) (Figure 5.1b). Their book deals with the entire area of the Land of Israel, and it is strange that the largest area of vineyards, which is in the Hebron area (on the West Bank), does not appear at all on the map.

The textbook authors circumvent the politically loaded issue of the borders of the state of Israel. However, in the prefaces to these books explanatory sentences appear concerning the borders of the state. For example: Harel & Nir in their 1965 edition include general statements about borders in the course of the discussion about the location of the Land of Israel in the Middle East: "The land stretches from east of the Mediterranean, from south of the Lebanon hills, from west of the Syria and Arabian deserts, and from north of the Sinai peninsula and Eilat Bay" (p. 17). In another book, by Orni & Efrat (1972), the authors state that the need for a discussion on the subject of borders is methodological in nature: a contradiction exists between the natural borders of the land and its political borders. The textbook, according to these authors, must adjust the borders in each of its chapters according to the material discussed within it. Therefore, in the physical geographical chapters, the textbooks refer to "the Land of Israel in its natural borders," while the human chapters relate mainly to the borders of "the State of Israel."

This dichotomy, between two territorial concepts (the "Land of Israel" and the "State of Israel") stands out sharply in the maps which accompany the textbooks: in the physical chapters, the maps present information about the entire area west of the Jordan River, including

the "West Bank," while on the human issues, the information presented relates to the area of the State of Israel only (Bar-Gal 1993b).



(After Hovton, 1990, p. 66)

(After Harel & Nir 1980, pp.220)

Figure 5.1 (a, b) The different treatment of the borders of the land of Israel in textbooks

The centralist attitude in the national educational system influenced not only the textbooks, but also the geographical teaching aids, which private publishers produce. An example of this is the atlas which is used in the education system. In order to be included in the list of books allowed for use in the schools, it was necessary to change the presentation of the borders in these atlases. From the beginning of the 1970s, the "Green Line," which is the cease-fire border of 1949, was erased from the maps in these atlases, and instead the "cease fire" border of 1967 was marked (Schachar 1988; Brawer 1975).

5.3.2 Daily newspapers

Students and their teachers are exposed to various sources of mass information, in both the written and electronic press. The prevalency of newspaper literacy in Israel is among the highest in the world, since the Israeli public is very sensitive to political and security-related issues, and follows them closely in the media. Newspapers and television often present various maps to describe events and explain their background. Developments in the field of computer graphics, as well as an improved quality of newspaper printing, help to create excellent carto-

graphic representation in the newspapers, which, in turn, increases the significance of geographic education for the comprehension of cartographic information.
The press in Israel has a particularly strong influence, and articles frequently appear concerning the subject of maps. One famous example of this is the third edition of the National Atlas of Israel, which was produced by the government survey department, in a bilingual edition (1986). A journalist who examined the atlas stirred up a public and political debate about the maps which appeared in it, which even led to discussions in the Israeli parliament. The journalist, who is identified with a right-wing party, published an article with the headline, "Trash the Israeli Atlas" (Uziel 1986), in which he criticized the text which accompanied the map describing the Jewish settlement in the West Bank, a text which was written by a leading Israeli geographer, Professor David Amiran. The minister responsible for the survey department was distraught by the criticism, and ordered the circulation of the atlas to be suspended, claiming that it was an official document of the State of Israel. After months of searching for another geographer to rewrite the controversial text in question, circulation of the rewritten atlas was resumed. This unusual example teaches of the importance of the press in Israel and the sensitivity of the political system to the subject of mapping.
The rare example of the Israeli Atlas is not the case we would like to emphasize, but rather, the maps which appear daily in the newspaper and television, such as weather maps, through which we can also trace the various political influences. Weather maps in the media are naturally standardized, and appear daily. Information about the weather is essential for daily functioning, and therefore, children as well as adults glance at them, and thereby receive, in a hidden manner, the ideology which lies behind the preparation of the map. Every newspaper and TV station prepares various base maps to describe weather, and attempts to produce them with a high quality of graphics, so that they will be pleasing to the eye.

Let us examine two of these maps closely. Figure 5.2 shows the weather map that appears in the Maariv newspaper (the newspaper which came out against the third edition of the Israeli atlas). The map describes the area of the Land of Israel, which is colored in green, on an orange background which describes the neighbouring countries. The use on the map of a unified colour for the area surrounding Israel, the lack of distinction between the countries which adjoin it, is a cartographic phenomenon which is likely to have political significance. In other words, the graphic symbolization aids the image of "us" versus "the enemies surrounding us". This is an accepted political message in Israel, which strengthens the image of "an embattled people". On the map are listed the daily temperatures next to the names of the large cities or geographical regions in Israel. If we look closely, the borders of Israel as presented on the map represent the right-wing ideological perception which refuses to see the area of the West Bank and Gaza as territory under a different sovereignty. According to the map that appears in this newspaper, all the territories located within the climatic map that are defined as "Israel" possess identical legal status.
On the other hand, the second map (Figure 5.3) is taken from the HaAretz newspaper, which is identified with the left and moderate centre in Israel. The political left in Israel is pushing for the political recognition of the Palestinians and encourages the government in its steps to create a different territorial identity for the territory of the West Bank and Gaza Strip. In the weather map of this newspaper, this ideology is expressed cartographically: the Gaza Strip

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region is separate from the area which refers to the borders of the State of Israel. It reflects the political distinction which exists between the area of the State of Israel and the area of the "Palestinian entity", as determined by the Oslo Accords.

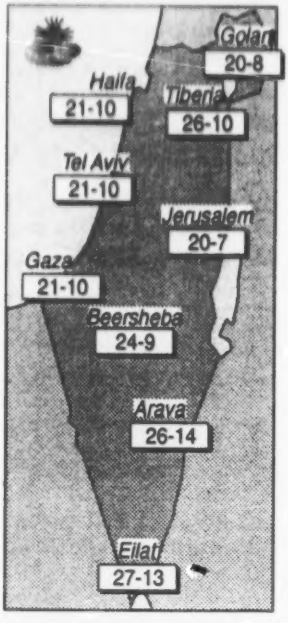

Figure 5.2 Map of Weather Forecasts in Israel, from the Maariv newspaper

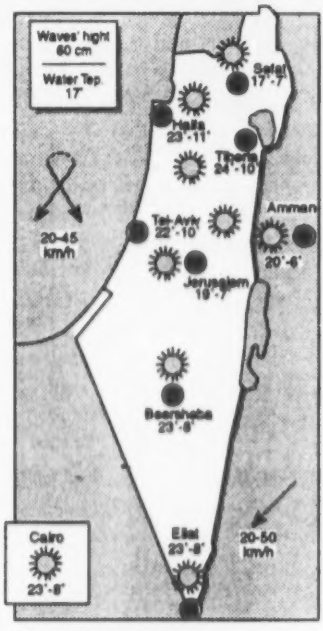

Figure 5.3 Map of Weather Forecasts in Israel, from the HaAretz newspaper

The sensitivity of the HaAretz newspaper's editor to maps and their political meaning can also be seen elsewhere. Since the peace accord between Israel and the Kingdom of Jordan was signed in Fall 1994, the climate map also includes the temperatures of Amman, the capital of Jordan, as well as an icon of the temperature in Cairo. This provides not only an informative service to tourists and travellers between the countries, but also a clear political statement. This statement includes Egypt and the Kingdom of Jordan within the field of the positive Zionist consensus, in contrast to other Arab countries, such as Syria or Lebanon, Israel's northern neighbours and enemies.

5.4 Discussion

Foucault (1980) raised the assumption that power and knowledge are elements that are linked to one another. Knowledge, he claims, is part of power: its role is to strengthen, perpetuate, and legitimize ideology. Moreover, he claims that the knowledge which geography has gathered has served the colonial and financial powers. In fact, one can extend his argument and

claim that one of the roles of knowledge is to act for the socialization of young people and adults so that they will receive the social and political values preferred by the ideology stance. Ideological messages are hidden through various tactics. The methods used to hide these messages are sometimes employed consciously, and sometimes unconsciously (Urry 1981). The tactics of hiding suit Habermas' (1971) perception concerning distortion in the media, which is that communicative events are not free of ideological presence and this presence is expressed through language. Bernstein (1975) calls the language which is thus created "formal language," in other words, the language of scientific and government reports, the language of various documents which serves the reigning ideology, in which reality is conveyed according to the wishes of the reigning power.

Various studies have indicated that geographical curricula are usually ethnocentric, and therefore, the textbooks which are used in schools also contain stereotypes and various distortions (Hicks 1980). Geographic education, language and knowledge used in the schools can be understood as part of the hegemony of the ruling power (Henley 1989). Textbooks and atlases, and the language which teachers use in their classrooms, are means of social communication that are exposed to the distortions of ideology. Despite the fact that according to cognitive psychology, as represented by Pavio (1971), maps and language are not similar representations, they have a common denominator. It seems that in the field of studying and comprehending space, maps are likely to have an advantage in encoding information so that it can be more readily retrieved from the memory, in comparison with verbal representations.

Cognitive studies of the memory mechanisms and perception of words, sentences and texts provide us with a basic assumption concerning the student who is studying and looking at maps. The map, as a graphic representation, receives a meaning compartmentalized according to the student's personality, which is important for the understanding and memory of the representation (see for example, Pavio & Begg 1981; Brown & Yule 1983). The map reader must assume that the information appearing in the representation is not a random collection of colour, lines and shapes that are organized on the paper. His experience and his cultural background will influence the way he remembers the information and the meaning they give the map. One must assume that the educational system, in teaching map-reading skills, creates the feeling in the student that maps transmit reliability.

Some individuals will wish to perceive the presentation of maps in textbooks, atlases, and the media as "cartographic propaganda", created by the state through the educational system, and the media, as part of a process of territorial socialization. These maps are another example of the creation of an "official language", which serves the political power for the sake of the survival of its ideas. The reputation of the media, textbooks and various atlases gives the maps presented in these fora a high level of reliability in the eyes of the "readers," who may not have the tools to criticize what is presented in these maps.

The case of Israeli maps shows that even in a democratic state with freedom of expression, ideological consensuses exist which are expressed in the information transmitted in the media and taught by the educational system. In the texts and maps of textbooks and atlases, which are seemingly objective, one may observe subjective, linguistic and cartographic distortions. This is even more the case in the media, in which cartographic representations and knowledge are not free of political-ideological influences. From this, it is clear that these maps, which are

presented to children and adults, are not free from ideological distortions. Therefore, geographers who deal with education must train their pupils not only how to use the map, but also how to understand its subjective meaning, which contains various ideologies. The case of Israel can serve to raise awareness of the meanings of cartographic and graphic representations that are created by various bodies and states. One must assume that a similar examination would allow criticism and better understanding of the information that appears in maps in other countries in the developed and developing world.

5.5 Conclusion

From our knowledge of propaganda and cartography, we set out to examine the expressions of intent of those who create various graphic representations in the context of territorial education. The examples provided from Israel (see also Figure 5.4) illustrate the various ways in which politics and ideology become involved in cartographic information. This study did not examine the response of pupils to these representations, but several assumptions on this matter may be made. One may assume that the more a student is aware that a particular representation was produced with very scientific methods, and presented with very exact graphic means, the more reliability will be attributed to the representation. Representations like these are then accepted as representing reality, without the student's critical thinking mechanism being activated, which could decypher the ideological intentions behind these representations. Even simple representations and sketches used freely, such as weather maps in the press, must not be underestimated: one must assume that in the long run, continued exposure to representations such as these allows them to become acceptable representations, and as such, they influence value judgements and various political positions.

ISRAEL and CALIFORNIA

ISRAEL and ARABIA

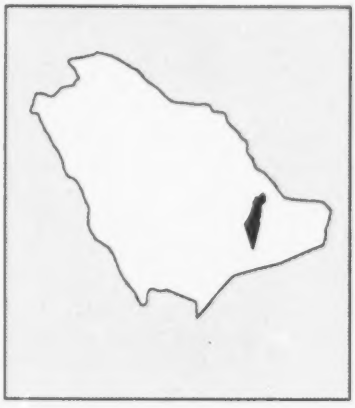

Figure 5.4 (a,b) Right-wing propaganda maps on the World Wide Web (Internet)

Let us conclude that adaptation of the approach presented in this article, in teaching map decoding and various graphic representations, will aid in consciousness-raising concerning the limitations of graphic and cartographic information. The reality which they are supposed to present is complicated, and no map or series of maps can represent reality as it truly is. This approach will aid in enriching the perspective which geographic education attempts to provide.

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6 MEANINGFUL LEARNING IN GEOGRAPHICAL EDUCATION

Shi Xuan

6.1 Introduction

The search for an ideal knowledge structure through which to achieve the general objectives of geographical education has been a major task of educational geographers for a long time. Such endeavor is perplexed by the interaction between the knowledge structure of learning materials and the cognitive structure of students which represents their cognitive level and ability. To coordinate these two structures which is a prerequisite for promoting meaningful learning in geographical education is the focus of this paper.

Based upon Ausubel's (1968) ideas of meaningful verbal learning the discussion will consider:

1 the systematic knowledge structure which is adopted in current teaching/ learning materials;
2 the conflict between the systematic knowledge structure and the cognitive level/ability of students which results in cognitive difficulties and invalid cognitive activity in geographical education; and
3 a potential effective knowledge structure which embraces educational targets and conforms with the requirements and prerequisites of meaningful learning.

It could be concluded through analysing the cognitive activity in geography in secondary school education that:

1 cognitive difficulties caused by the conflict mentioned above is unlikely to be solved through pedagogy;
2 knowledge and its organizing structure of teaching/learning materials should conform with the cognitive level/ability of students;
3 precise specification of educational aims is the precondition for establishing an effective knowledge structure; and
4 "order out of the chaos" would have to be regarded as a general law in the process of developing the cognitive ability of students in geography.

This paper will concentrate on the geographical cognition of students aged 12-15 years in junior high schools in the People's Republic of China.

6.2 Theory: meaningful learning in geographical cognition

Teaching/learning materials, the link between teacher and student, are central to innovation in geographical education. They contain the content and method of that which is to be taught and learned on the one hand, and they influence the quality and effect of the teaching/learning activities on the other. Hence research concerned with the content of geography courses and their organizing structure will identify the cognitive difficulties of students caused by structural problems of the learning materials in geographical education and therefore will promote meaningful learning in geographical cognition.

6.2.1 Meaningful learning and geographical learning

Ausubel's (1968) ideas on meaningful verbal learning suggest that:

1 one of the essential requirements of meaningful learning is that the learning materials should have potential meaning to students. This means that learning materials should establish contact with those appropriate conceptions in the previous cognitive structure of students;
2 the prerequisites of this requirement are that:
   a the learning materials should possess logical meaningfulness;
   b appropriate conceptions should be found in the previous cognitive structure of students to establish contact with the new learning materials; and
3 that without these requirements and prerequisites cognitive activity will only lead to rote learning.

However, cognitive activity in geography is complicated in the secondary school system by the special characteristics of the subject. These are illustrated in the *International Charter on Geographical Education* as including: "its breadth of study, its span of methodology, its synthesis of work from other disciplines including the physical sciences and the humanities and its interest in the future management of people-environment interrelation" (Haubrich et al. 1992).

For this reason, it is difficult to satisfy all of the requirements and the prerequisites of meaningful learning in geographical instruction and cognition. Educational geographers must ask two questions:

1 Can the learning materials be organized with logical meaningfulness? It is difficult to find links with the previous cognitive structure of students, since students do not have adequate knowledge of other relevant disciplines;
2 If the learning materials conform to the cognitive level/ability of students to satisfy the second prerequisite of meaningful learning, can the knowledge structure of such learning materials be designed so they are not miscellaneous without internal relation or logical meaningfulness?

Under such circumstances, is it really possible to promote meaningful learning in geographical cognition? Educational geographers should try to prepare a reasonable analysis and explanation of such problems and then develop constructive and innovative ideas to recognize the characteristics of meaningful learning in geographical education.

6.2.2 Educational target

Such an analysis would have to start with the general aim of geographical education which decides the fundamental content and framework of cognitive activity in educational practice and meanwhile directly or indirectly causes some of the cognitive difficulties in geography teaching and learning.

The general aim of geographical education is holistic and profound as students are expected to have "increasing international competence in order to ensure effective cooperation on a broad range of economic, political, cultural and environmental issues in a shrinking world" while high quality geographical education should "encourage both a balanced regional and national identity and a commitment to international and global perspectives" (Haubrich et al. 1992). It is a common requirement that through school education, students should master basic geographical knowledge and skills. Even though the knowledge and skill are basic, the content of course is very extensive as geography is a synthesising subject which involves many other fields and only such a comprehensive knowledge system could contribute to students understanding the complicated characteristics of the geographical environment.

In China, since most students can not continue their senior high school education for various reasons, it is suggested that during the nine- year compulsory education period of (6 year elementary school education and 3 year junior high school education), students should acquire the essential geographical knowledge organized by systematic structure and environmental awareness. In educational practice, the newly published Syllabus and teaching/learning materials for compulsory education really reflect the fundamental system of geography which covers both regional (world/China) geography and thematic studies. Such extensive content has been arranged within a two-year curriculum for junior high school students of 2 classes per week (90 minutes).

Such an arrangement reflects the requirement of the educational target and ideology. However, it is equally important that educational geographers endeavour to relate the teaching/learning materials to the prerequisites of meaningful learning.

6.2.3 The presentation order and organizing structure of geographical concepts in teaching/learning materials

The concept of meaningful learning requires that new learning materials should establish stable contact with appropriate conceptions in the learner's previous cognitive structure. According to this principle, special attention should be paid to the presentation order and the organizing structure of the geographical concepts in learning materials. When a certain concept can be assimilated into the cognitive structure of students (that is, it can be understood and mastered by students), it will become the basis for the assimilation of the relevant concepts or propositions in the new learning materials. For example, if students can not understand the result and effect of the "Coriolis force law", cognitive difficulties will appear in learning new material such as atmospheric circulation and the system of ocean currents.

To avoid any possible cognitive difficulties caused by false order and structure, educational geographers should study and analyse the connection and the presentation order of each geographical concept in the learning materials for a more favourable organizing structure to enable students to assimilate those geographical concepts gradually into their cognitive structure. That is why educational geographers choose a systematic structure to organize the learning materials as those geographical concepts can then be presented to students in an orderly manner.

6.2.4 The cognitive level/ability and knowledge reserve of students

As has been stressed above, the most important factor affecting meaningful learning is what the learners already know. Although teaching/learning materials may be logically meaningful, research on whether or not students possess the appropriate cognitive ability to assimilate geographical knowledge has been neglected. Cognitive difficulties appear in learning processes because at the initial stage of geography learning students do not have adequate knowledge reserves in their previous cognitive structure to provide the anchors on which to base the new learning materials. In other words, there is a conflict between the low cognitive level of students and the higher level of instructional materials and this inevitably results in cognitive difficulties.

In Chinese junior high school education, geography organized within a systematic knowledge structure is introduced to students whose mathematics knowledge is inadequate. On the one hand, their knowledge of the three dimensional location-orientation system and the projection can not be assimilated into a one-dimension numeric (rather than a geometric) cognitive structure, and their knowledge reserve of physics is low, while on the other hand, their knowledge of earth movements and its geographical significance always causes various cognitive difficulties as these important geographical concepts in the new learning materials cannot be placed within their previous learning activity.
If cognitive activity in geography starts with meaningless learning, how can the learning outcomes be meaningful? Rote learning comes out of such invalid cognition.

6.2.5 Cognitive structure and knowledge structure

If we may assume that (1) the cognitive structure of students reflects the knowledge structure of teaching/learning materials; (2) the cognitive structure of the more able students approximates the knowledge structure of teaching/learning materials; (3) the cognitive structure of less able students differs greatly from the knowledge structure of teaching/learning materials, then it may be concluded that, in the cognitive process of geography learning, the real cognitive level/ability of students determines their capacity to understand the knowledge structured in the learning materials. If a stable anchorage cannot be found in the previous cognitive structure of students, even though the knowledge structure presented to students is logically meaningful, students will only partially assimilate the learning materials. Whether very able

or less able, their cognitive structure cannot reflect the comprehensive and integrated knowledge structure of the learning materials.
Any endeavors to solve the cognitive difficulties of students in geography will be fruitless if such difficulties are only treated as pure problems of geographical cognition without considering whether students could possess the adequate knowledge of other relevant disciplines. The prerequisite for formulating the knowledge structure of geography learning materials is the cognitive level and ability of students rather than the internal or logical relation of the subject knowledge.

6.3 Method: organizing an effective knowledge structure

To some extent the cognitive difficulty of students in geography learning comes out of the conflict between the knowledge structure of systematic geography as a secondary school subject and the previous cognitive structure (i. e. real cognitive level or ability) of students. For that reason one effective way to eliminate or reduce cognitive difficulties is to ensure the consistency and harmony of these two structures to conform with the requirements and the prerequisites of the meaningful learning under the guideline of the general target of geographical education.

6.3.1 Queries on the knowledge structure

Evaluation of the knowledge structure should first of all study the history of human being's cognition of the geographical environment which reflects the process of knowledge accumulation and the development of discipline geography to set up a reference frame of the cognitive law.
People recognize their environment at a range of scales from near to far, from local to global. In this way people acquire and accumulate scattered and miscellaneous information about the environment and then, different specialized subjects develop until finally geography evolved into a synthesising and systematic science.
Cognitive activity in geography for secondary school students at least in China follows a different but reverse order in contrast to the historical process. It is taught from global to regional then local, from far to near. The content of geography course consists of three parts:

1 the earth and orientation, earth movement (rotation and revolution) and its geographical significance; the map;
2 world geography from the general characteristics of physical environment, natural resources and human activities at global level/scale to the world regional/state geography (all above in junior grade one, age 12-13); and
3 geography of China, from the nationwide scale to different regions in China and finally the home-province and home town (within junior grade two, age 13-14). This arrangement ignores the curricular schedule of other relevant subjects.

If the history of human intellectual development in geography could be regarded as the cognitive process of one person, it could be realized that such process conforms with the requirements and the prerequisites of meaningful learning. Then it is quite clear that the geographical cognition of secondary school students under the above mentioned knowledge system and organizing structure can not satisfy the demands of meaningful learning. However, there is no necessity to echo such historical process in educational practice.

6.3.2 The idiosyncracy of school cognitive activity in geography category

It is a perplexing problem whether geographical cognition should follow the historical course of human knowledge accumulation since such a strategy will also lead to meaningless learning as the knowledge structure of geography learning materials could not satisfy the prerequisites of meaningful learning. Geography shows its idiosyncracy in contrast with the knowledge system and learning process of other subjects of sciences at secondary level.

None of the other subjects has an ambitious educational goal like geography which asks students to understand or master the subject knowledge as a whole which covers both natural and social sciences as well as the systematic structure of the subject within the two year learning period without adequate time allocation. Distinctly, the content of other subjects' learning materials is much more unitary and consequently its organizing structure is concise and easy to arrange with logical meaningfulness as their cognitive tasks concentrate within one specific academic field. In the secondary school education system, geography is a unique interdisciplinary course.

Also in planning the curriculum, consideration has been given to the interrelationship of relevant subjects, since the cognitive difficulties of students in certain courses could be reduced if they possessed the essential knowledge of other courses. For example, physics starts from junior grade two. This arrangement acknowledges students' mathematical knowledge reserve and cognitive ability. On the other hand, attention must be paid to continuity of subject learning - since the cognitive disruption will reduce the cognitive achievements in subject learning and the coherence/progression of learning activities. For example, chemistry learning starts from junior grade three as the content of the course is a great deal less than for other subjects. This arrangement acknowledges both the knowledge reserve of students and the cognitive continuity from junior to senior grades study. However, geography is an exception. Unfortunately no consideration on either respect is given to geography even though geography is an interdisciplinary course.

Moreover, when attention is paid to the relation between the knowledge structure of other subjects, learning materials which formulate the cognitive order of learning activity, and the historical development of the subject knowledge system, it could be realized that the knowledge presentation order in learning materials generally conforms to the developing process of the subject knowledge system, thus the cognitive activity of students should focus on one specific field within that certain subject. The precondition for any alteration here would be that the presentation order should be made to conform with the prerequisites of meaningful

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learning since some scientific theories and experimental justifications could not be taught sequentially.

Such characteristics could be evidenced by mathematics learning which starts from arithmetic to algebra, from plane to solid and analytic geometry, from one dimension to multi-dimensional. Similar evidence could be found in the cognitive/learning activity in every specific field of physics. For example, mechanics starts from statics to kinematics and further dynamics/kinetics; while chemistry learning is organised from element to reaction and from inorganic to organic chemistry. But it is a dilemma to educational geographers to decide whether learning materials should directly present the systematic structure of modern geography or be arranged on the basis of the historical development of the subject knowledge system.

6.3.3 Ideation scaffold: difficulties in cognitive/learning activity

Cognitive difficulties of students in geography learning could be attributed to an ideation scaffold, based on adequate knowledge of other relevant subjects. New learning materials could not be assimilated into the cognitive structure of students without such anchorages. Thus it is understandable that students would inevitably find it difficult to go further into geographical investigation, especially in scientific reasoning and analysis. Such a proposition could be demonstrated by the following typical case study.

Atmospheric pressure is an important concept in geographical cognition. To assimilate this abstract new concept, the "anchoring idea" should include the following necessary physics conceptions: mass, density, pressure as well as relevant knowledge of thermodynamics. In the teaching/learning process, atmospheric pressure as a geographical concept is a little different from the physics definition as this notion usually indicates the horizontal pressure which causes the horizontal movement of air near/above the ground. Apparently such relevant physics knowledge takes the role as the ideation scaffold in geographical cognition.

It is an unrealistic supposition that students in junior grade one could assimilate the concept of atmospheric pressure into their cognitive structure without any physics knowledge. On the other hand, to understand or master the concept of "atmospheric pressure" is a precondition for studying relevant geographical knowledge, such as atmospheric movement/circulation, weather and climate. "Atmospheric pressure" is the anchorage of the new learning materials. Without the necessary anchoring ideas, the cognitive difficulties will be insurmountable barriers to students and would inevitably lead to rote learning.

6.3.4 Potential effective knowledge structure

To promote meaningful learning in geographical cognition, educational geographers should organize an effective knowledge structure which could embrace the general target of geographical education on the one hand, and satisfy the requirements and the prerequisites of meaningful learning, on the other. Such endeavor should give special consideration on the cognitive level and ability of students.

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6.3.4.1 Resolution of the educational target

No matter how idiosyncratic geographical education is, it is an unrealistic idea to anticipate that students can understand and master the subject knowledge and structure as a whole within two academic years in junior high school education. In fact geographical education has never reached such ambitious goals. It represents a failure of such educational ideology and strategy. However, under the direction of such a holistic educational objective, it is not an easy job to lower the difficulty of learning materials even though this has been designated as a main topic in the innovation of learning materials in China at the present time.

In order to accomplish the instructional assignment within the fixed time allocation, some geographical concepts in learning materials are vague rather than scientifically accurate, students are no longer asked to understand or master "difficult" knowledge and even some part of the content in learning materials has been deleted. Such unreasonable strategies would inevitably sacrifice the quality of cognitive activity as the teaching and learning processes are not logically and scientifically meaningful without the necessary and appropriate academic standard.

Under such circumstances, the general target of geographical education should be resolved into different levels, elementary, secondary and tertiary, just like other subjects in secondary school education system, as such holistic goal could not be fulfilled at the secondary level. Educational targets of different cognitive stages in secondary school should be determined on the basis of the cognitive level/ability of students while the knowledge structure of learning materials should conform with and be subordinated to the cognitive structure of students.

According to such principles, the educational target of secondary school geography could be classified as following:

1 issues-based regional studies for junior high grades;
2 issues-based systematic geography for senior high grades.

Educational ideology should also be changed at the same time. In junior grades, cognition on a certain region will only focus on several typical environmental features rather than the every respect of the region without any practical cognitive significance. For example, "there are a lot of rivers and lakes in the European continent", but in fact, students could only find two rivers but no lakes from their textbooks and students' atlas. In senior grades, through issues-based typical case studies in each learning unit, specific topics on the essential knowledge, methods, theory or thought of geography could be introduced to students individually and selectively. "Issues-based" should be emphasized as such "issues" will take the role of "advance organizers" in cognitive activity.

6.3.4.2 Requirements and prerequisites of meaningful learning: guidelines for evaluating the potential effectiveness of the knowledge structure

The resolution of educational targets creates favourable conditions for promoting meaningful learning in geographical cognition. To satisfy the two prerequisites, the knowledge structure of learning materials would have to be organized in the form of a combination of independent cognitive unit other than a systematic network because when specific concepts or proposi-

tions are deleted as they could not be assimilated by students whose cognitive level/ability is restricted, such a perfect network will be broken up and no longer be logically and scientifically meaningful.

The effective knowledge structure will emphasize the logical meaningfulness of each independent cognitive unit in learning materials rather than the interrelationship of the subject knowledge within the systematic structure which is a remarkable feature of the present learning materials. As the cognitive unit is independent, educational geographers could make a flexible and balanced determination to structure a geography curriculum which covers various facets of the subject to embrace the desired educational goals on the one hand, and, once the topics/themes of each cognitive unit are determined, learning materials could be organized according to the requirements and the prerequisites of meaningful learning, on the other.

6.4 Student material: pedagogical limitations

Educational geographers have been trying to improve learning methods to solve the cognitive difficulties of students and promote meaningful learning in geographical cognition. As some cognitive difficulties are caused by the structural problems in organizing the learning materials, such difficulties could hardly be solved in a pure pedagogical way.

If educational geographers are asked to attend a lecture on the scientific/academic report of superconduction given by a specialist for example, no matter how excellent the lecture is, it would be difficult for us to assimilate those abstruse new "learning materials" into our own cognitive structure, i.e. we can't understand the content of the lecture. Should such cognitive difficulties be attributed to the academic level, demonstration logicality, knowledge structure, presentation order or interpretation method of the lecture? Such supposed learning circumstance could be regarded as a reference frame for educational research on students' cognitive activity.

Meaningful learning in geographical cognition is conditionally constrained by specific requirements and prerequisites. In view of the cognitive level/ability of students and the idiosyncracy of the geography discipline in the curriculum, it could be confirmed that (1) meaningful learning can not always be enhanced by training in general inquiry skills; and (2) meaningful learning may be enhanced only when its requirements and prerequisites are satisfied. Such a proposition may be evidenced by the following case studies.

Students start their geographical cognition from "location and orientation" at junior grade one. The teaching and learning process shows such pedagogical limitations to solve the cognitive difficulties of students. In educational practice, the accurate and scientific concepts/definitions of longitude and latitude, meridian and parallel could hardly be interpreted to students even with the aid of the theodolite because what they really learned is only arithmetic, their study on algebra just begins at this stage, and, they do not have adequate essential knowledge of plane and solid geometry. These definitions presented in learning materials are only general terms without any explanation of the mathematical principles of the locational system which apparently could not be assimilated by students.

Let us examine the definition of these key concepts as presented in Chinese learning materials

1 "parallel is the circle which is around the terrestrial globe in east- west direction";
2 "as people could draw many parallels on the globe, they mark different degrees to each parallel to distinguish parallels from each other. This is the latitude";
3 "meridian is the line that links the north and south pole while it is perpendicular to the parallels";
4 "as people could also draw a lot meridians on the globe, they do the same to mark different degrees to each meridian to distinguish meridians from each other. This is the longitude".

Students seem to be able to read the longitude and latitude of a specific point on the map or globe with the aid of such locational systems, but in fact, they determine the location through the numeric alteration of the longitude and latitude rather than a thoroughly understanding of the real mathematical method of orientation. Therefore their cognition of such important geographical concepts/propositions is only a simple game of the numeric alteration principle. If the students can master the game rules then they can read out the right location.

Cognitive difficulties appear in the following cognitive activities when students study the earth revolution and its geographical significance which involves the complicated relative movement and the calculation of longitude and latitude, such as the Tropic of Cancer/Capricorn, and the Arctic/Antarctic Circle. They cannot understand all these new learning materials, a combination of physics and mathematics on the basis of the analysis of three-dimensional space. Furthermore, if students cannot understand the geographical significance of the earth's revolution, especially the global distribution and annual alteration of solar radiation on the earth's surface, their cognitive activities in the field of climatic geography will inevitably result in cognitive difficulties and rote learning.

If educational geographers can not understand superconduction, then they should understand the reasons for cognitive difficulties of their students in the field of geography. Attention should once again be paid to the so- called "ideation scaffold" in the learner's cognitive structure. The "anchorages" in geographical cognition could be organized and presented in such an order : the necessary/adequate mathematics knowledge (anchorage) -- location and orientation, its method and significance; necessary physics knowledge about movement (anchorage) -- earth revolution and its geographical significance; relevant physics knowledge of thermodynamics (anchorage) -- climatic geography (anchorage) -- and so on. No matter what method educational geographers are trying, cognitive difficulties could not be solved without necessary anchoring ideas in the learner's cognitive structure. Adaptation would have to be made under such circumstance, such as the numeric game as the substitute of the mathematical method which could not be assimilated by students until their senior grade learning period.

6.5 Conclusion: order out of chaos

The innovative knowledge structure proposed in this paper which could both embrace the desired educational aims and satisfy the requirements and the prerequisites of meaningful

learning, will promote meaningful learning in geographical cognition but no longer maintain a systematic structure of geographical knowledge as a whole. Also teaching and learning will only emphasize a few facets of geography in each independent cognitive unit but will no longer present the holistic knowledge system of geography.

Innovation is first of all a challenge to the current educational ideology whose ambitious educational objectives are unrealistic illusions and have never been fulfilled in China. On the other hand, censure has been raised that any innovation which sacrifices the systematic organizing structure of learning materials will lead to chaos in learning activity.

Attention should be once again paid to the requirement of a "balanced" selection of the course content in such innovations. Thus learning materials will cover many or even all facets of geographical knowledge and what should be deleted or adapted is only those which can not be assimilated by students at particular stages of their intellectual development. The general target of geographical education could be fulfilled even though the cognitive activity is organized in independent units without the systematic knowledge structure and what is more, a cognitive law could be concluded.

"Order out of the Chaos", the title of the work written by Prigogine & Stengers (1984), is not only a good answer to such query but also reflects the general law of the development of human intelligence, the law of the historical development of the scientific discipline of geography, and the law of development of the cognitive level/ability/structure of students. As a common law, it could be realized that the condition of Chaos exists universally in the cognitive process. The chaos condition/process itself is part of meaningful learning activity in geographical cognition. "Haste is waste" as systematization occurs only when students assimilate/accumulate adequate scattered knowledge of both geography and other relevant subjects.

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7 AN EXPLORATION OF THE ROLE OF THE TEACHER WITHIN ENQUIRY BASED CLASSROOM ACTIVITIES

Margaret Roberts

7.1 Introduction

This chapter explores a theoretical framework for enquiry, and relates it to a theoretical framework about curriculum control. It gives an account of a small piece of action research carried out in 1995 by a group of student teachers on a one year Post Graduate Certificate of Education course in England. They explored the concepts of 'enquiry' and 'control' through classroom experience with 16-17 year old students. Each of the theoretical frameworks introduced, namely those related to *enquiry*, *curriculum control*, and *action research*, can be applied to a wide range of circumstances in which beginner teachers are learning to teach.

7.2 Theory

7.2.1 Geographical enquiry

The word 'Enquiry' has been used in relation to geographical education to mean: hypothesis testing; individual projects by pupils; and field-work. There is, however, a broader meaning of enquiry which is related, not just to occasional activities, but to the whole process of constructing geographical knowledge. A useful theoretical framework for this meaning of enquiry is provided by 'the route to geographical enquiry' which was developed by Naish et al. (1987) to guide the development of a new geography curriculum for the Schools Council's 16-19 Geography Project (Student material, Figure 7.1). The framework is underpinned by particular philosophies of knowledge, concepts of geography, methodologies and pedagogic values.

It is based on the view that knowledge is constructed. Naish et al. (1987, p. 36) claim that "the starting point for study is *necessarily* a question, problem or issue" (my italics). Thus *all* geographical knowledge is seen as existing in response to questions which have been asked in the past and which must be asked again during the teaching and learning of geography. Geographical knowledge is not seen as something which exists, to be handed over to pupils, outside the questions to which it provides answers.

The framework outlines the parameters of geography by the questions it lists. It defines geography as a wide ranging subject, answering not only questions of "what?", "how?", and "why?", but also questions such as "what might?" and "what do I think?". These questions probe issues from many different angles in an integrated way, rather than systematically.

The 'route for geographical enquiry' values the search for answers through both quantitative and qualitative methods by suggesting that both 'more objective data' and 'more subjective data' are of relevance in answering questions. Methodologically, it represents a pluralistic approach to enquiry, allowing for hypothesis testing on the 'more objective' side of the framework and for behavioural, humanistic and structuralist approaches on the 'more subjective' side of the framework.

Although the enquiry framework was devised to encompass 'a range of teaching methods and approaches' (Naish et al. 1987, p.45) it is underpinned by assumptions that students learn through active engagement with their work. Both 'factual enquiry' and 'values enquiry' are expressed in a series of verbs, e.g. define, collect, assess, analyse, consider, evaluate. Many of the activities listed describe skills which are general rather than specifically geographical.

'The route for geographical enquiry' is not without its problems as a model for geographical education in the 1990s. The framework was produced in the early 1980s and is a product of its time. It emphasises a modernist, objective view of geography. The values enquiry side of the framework treats subjective data as evidence to be analysed, rather than data to be explored for its meaning. It preceded the current post-modern developments in the subject, in which diverse subjective representations and interpretations of the world are given validity. Also, while specialisation in the domains of either physical geography or human geography continues in higher education in addition to more integrated work, this framework favours an integrated view of geography, encouraging more attention to issues involving both people and the environment.

The model is, therefore, not presented here unproblematically as the 'correct' model. It is selected partly because of its widespread use in England and Wales and partly because of its flexibility. In 1995 more than 12,500 students took the University of London Advanced Level geography examination based on the Schools Council 16-19 Geography Project. Although the route to enquiry framework might appear to be prescriptive it can be adapted to suit particular investigations by omitting parts of the framework, adding new questions and changing the sequence.

7.2.2 Controlled, framed and negotiated learning

The Schools Council 16-19 project promoted the active involvement of students in enquiries. The amount of teacher involvement in planning and controlling an enquiry could vary, however, from a high degree of control in structured problem solving activities to activities for which no direction was given by the teacher. In outlining these possibilities, Naish et al. (1987, p. 45) seemed to suggest that an enquiry would be located in its entirety at one point along a continuum of teacher control and pupil freedom.

The idea of a continuum of control/freedom can be explored further by using another theoretical framework produced by Barnes et al. (1987) (Student material, Figure 7.2) during their evaluation of a Technical and Vocational educational project. They became interested in the degree of control which teachers maintained over knowledge and its construction. Although the degree of control was seen as a continuum three categories were tentatively suggested:

closed; framed; and negotiated. Figure 7.2 shows how the meaning of these categories was developed in relation to content, focus, students' role, key concepts and methods.
This theoretical framework is valuable in thinking about enquiry in several ways. It draws attention to different possible roles of a teacher in relation to knowledge and knowledge construction and the way these interact with the role of pupils. It suggests that action at different ends of the spectrum is underpinned by different values. At one end of the spectrum authority and authoritative knowledge is implicitly valued by the actions taken, while at the other end freedom and emancipation is valued. Instead of judging classroom activities as right or wrong according to some concept of what enquiry *should* be, activities can be discussed in relation to underpinning values.
Furthermore, in Figure 7.2 the three categories are applied to different aspects of knowledge construction. By distinguishing between content, concepts and methods it permits consideration of different degrees of control being applied to different stages of learning. For instance, *content* could be 'tightly controlled' by the teacher, but the *methods* to be used in investigating that content could be negotiated with a class. The representation of the concept of control as a framework rather than simply in linear form as a continuum, enables it to be used flexibly.

7.2.3 Action research

The theoretical models of enquiry and control outlined above were starting points for an investigation which was influenced by a theory of action research.
Action research is carried out by practitioners in their working situation, and not by external researchers. It provides a way of *exploring* theory in a practical social situation, instead of *applying* theory to practice in a technical sense. The aim of action research is not to prove or disprove theory, but to improve practice and to increase professional wisdom. Action research can introduce beginner teachers to concepts of continuous professional development.
Grundy (1987, p. 146) conceptualised action research as a spiral in which four stages, identified by Grundy and Kemmis in 1981 (reported in Grundy 1987), are related to each other in a continuous process of looking back and looking forward. The four stages are: plans; action; observation; and reflection.
At the *planning* stage, researchers plan the research looking back to previous experience to determine the focus of the research. Researchers also look forward to the action. For example, they plan the lesson which will be researched.
At the *action* stage, the researchers become the practitioners working in the situation being researched. They are aware of the research focus already planned and are remembering things to take forward to the next stage of the spiral. Action research gives the practitioner a heightened awareness of the situation, during the action.
The third stage of the spiral, *observation* or *reconstruction*, follows the action. During this stage the action is looked at again, possibly with the aid of data collected, or with the aid of a collaborator. The action is reconstructed from all the data collected bringing to the surface issues for reflection.
The fourth stage of the spiral, *reflection*, uses the information from the reconstruction to evaluate what happened and to look forward to the next phase of planning and action. This

model of action research, rather than being represented as a linear process, emphasises the continuous process of looking forward and looking back and the inter-relatedness of the stages. The practitioner is involved at every stage of the spiral. The model emphasises the cyclical nature of professional development and the need for both action and reflection.

7.3 Methods

7.3.1 Context

The following investigation involved co-operation between a university, a school and a tertiary college. The student teachers had already completed 13 weeks of their one year course, including six weeks of practical experience in schools, when they started the investigation. It was in three parts, following the stages of action research listed above: planning; action; reconstruction and reflection.

7.3.2 Planning: preparatory work at the university (4 hours)

7.3.2.1 Brainstorming

The student teachers noted down words and phrases related to 'enquiry'. These were shared and discussed to explore the characteristics of enquiry.

7.3.2.2 Introduction to the 'route to enquiry'

They worked in groups comparing their existing understanding with the framework presented (Student material, Figure 7.1). This extended their understanding of 'enquiry' to include classroom enquiry, the use of a greater variety of questions, enquiries into values and the use of more subjective data.

7.3.2.3 Introduction to the 'control' framework

They were introduced to the control framework (Figure 7.2) by being given both fieldwork and classroom examples to exemplify the categories of 'closed', 'framed' and 'negotiated' in the control framework. They then used a grid (Student material, Figure 7.3) to analyse a fieldwork experience in which they had taken part. The analyses were shared, so that they could discuss variations in control of enquiries at different stages.

7.3.2.4 Examples of resources for enquiry

They worked in pairs studying twelve Decision Making Examination papers from the University of London 9219 Geography A Level syllabus, presented as examples of the types of resources and activities which might support classroom enquiry. An issue which arose during

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discussion was the extent to which the skills needed to deal with the resources were geographical or general.

7.3.2.5 Initial planning for the classroom

Groups of between four and six student teachers worked together to plan for the classroom. They would be working for half a day with between sixteen and twenty-four A Level pupils (16-17 year olds). They had to develop an enquiry based classroom lesson and to consider the extent of teacher control at each stage. In order to strengthen the focus on enquiry and control, rather than on resource production, the students were given Decision Making examination papers, with their accompanying resources (Student material, Figure 7.4), chosen by the schools involved. Three groups of students worked on issues related to Pont du Gard, in the South of France. Three groups worked on issues related to the Lake District of England. Throughout the planning the students were encouraged to take into account the theoretical frameworks provided.

7.3.3 Action: enquiry in the classroom (150 - 180 minutes)

The three lessons based on Pont du Gard in France illustrate the range of approaches used. Comments on their role as teachers, based on debriefing interviews, will follow each example in italics. (N.B. To avoid confusion the student teachers will be referred to in this section as 'teachers' and the 16 and 17 year olds in both the school and the tertiary college will be referred to as 'pupils').

7.3.3.1 Group A's lesson: 'Role Play'

- **Presentations to the whole class by the teachers**
  They outlined the main issue, then talked about each resource, ensuring that everything was understood.
- **Group work in specialist interest groups**
  Pupils were put into groups representing different interests, e.g. Bureau de Tourisme, conservationists, local residents. Each group, guided by one of the teachers, studied the resources looking for evidence which related to their interests.
- **Public Enquiry**
  Each group presented their case at a public enquiry, so that all viewpoints were heard.
- **Decision**
  The pupils were asked to come out of role and vote.

The first half of this lesson was closed. The teachers told the class what the issue was and then talked authoritatively about each piece of data in turn, The teachers felt the resources were complicated and needed to be presented and explained before the pupils could use them confidently. The second part of the lesson was framed. Pupils were given a problem and asked

to solve it, with guidance. The activity was chosen by the teachers but pupils had freedom to make suggestions, test them against the teachers' views and, in the role play, against the arguments of other pupils. The teachers' roles in this lesson shifted from keeping tight control of the enquiry at the start, to giving more freedom to the pupils to make their own sense of the data and their own decisions as the lesson progressed.

7.3.3.2 Group B's lesson: Competing companies

- **Brief introduction**
  The teachers outlined the issues and divided the class into three competing companies, each of which had to devise a development plan for Pont du Gard.
- **Group work in 'companies'**
  Each group looked at all the resources, taking into account all viewpoints. Each teacher adopted a different role, e.g. archaeologist, local farmers, tourist officer, and visited each group or 'company' in turn. They introduced themselves in role and pupils were expected to ask them questions and to seek advice.
- **Presentations**
  Each 'company' presented its plans to the whole class.
- **Decision**
  The teachers judged which company should get the contract.

The initial brief presentation of the issue was closed; it was not negotiable. The group work activity was framed so that pupils had to decide which resources were relevant and how to react to conflicting advice from the teachers in role. The final part of the lesson was closed with the teachers keeping control of the criteria for judging the presentations. The teachers' roles in this classroom were mainly as a consultants with expert knowledge. By giving advice in response to need the teachers were giving the pupils a more active role in the enquiry, than pupils in lesson A.

7.3.3.3 Group C's lesson: Grouping and regrouping activity

- **Brainstorming**
  The resources were distributed. Pupils were invited to scan them and decide which groups of people might be interested in issues related to Pont du Gard. The pupils were allocated to these interest groups.
- **Group work in four specialist interest groups**
  Pupils studied the resources in role, working out what their group would be interested in and what decision they would want. The specialist groups then split up sending one representative to each of four general groups
- **Group work in four general groups**

Each person presented the views of their interest group to the others, so that all four viewpoints were heard and recorded. The general group had to agree on a management plan taking into account the different views presented.

- **Presentation of management plans to the whole group**
- **Decision**
  Voting on best plan by pupils.

The teachers in this group started the lesson by negotiating with the pupils who would have interests in the issue. The pupils' suggestions were legitimated by being used as a basis for the specialist groups. The group work activity was framed to enable specialist groups to discuss their viewpoints and reach agreement before testing their ideas in general groups. During the lesson the teachers' roles were as consultants. They gave the pupils the responsibility of investigating facts and opinions from the resources. They gave them responsibility for passing on their findings to others. They managed the procedures to encourage pupil participation and responsibility. The pupils relied more on resources than teachers as sources of information.

7.3.3.4 General comment on the teacher's role

In each of these examples the general issue and the resources were determined by the examination paper. This is typical of many geography lessons in schools where the issues to be studied have been decided by the syllabus or by the teacher, and where the teacher provides resources to study the issue. There is little scope in such enquiries to work at the negotiated end of the continuum in terms of content. In using the resources to investigate an issue, however, there is scope for great differences in the opportunities given to pupils to make choices, to test out their own ideas, and to make their own judgements. Although the three classes had the same resources on the Pont du Gard, they learned different enquiry skills because of the way the teachers organised the enquiries into the issues. In lesson A, pupils may have learned more about interpreting different types of data, in lesson B, pupils may have learned more about using conflicting data and in lesson C, pupils may have learned more about explaining a viewpoint to others.

7.3.4 Reconstruction and reflection

After the lessons each group of teachers had a debriefing session with the university tutor. Firstly, they reconstructed the lessons by describing from their individual experiences what had happened. Secondly, they discussed the extent to which they had used the range of questions and activities in the 'route to enquiry'. Most had not been conscious of the enquiry framework during the lesson, but its use in planning had ensured that most aspects were included. Thirdly, they discussed the lesson in relation to the categories of 'closed', 'framed' and 'negotiated' considering how their control of the enquiry had shifted throughout the lesson. They had been aware of the control framework throughout the lesson not only in

implementing the overall lesson plan, but in their many interactions with pupils. Lastly, they discussed the implications of the choices they had made about controlling the enquiry and handing over control to the pupils. They felt that pupils gained from working away from the controlled end of the continuum, not only because it engaged them in geographical thinking, but also because it increased their general skills and confidence. It increased pupils' ability to speak in front of others, to engage in debate, to take responsibility, and to make judgements. They felt it was important to develop these qualities and that the two processes of developing geographical and general skills could operate alongside each other.

The discussion raised questions for further investigation in the next stage of their action research cycle, which would be during a twelve week block of school experience. Most students, starting from a tendency to control the whole enquiry, had begun to think about releasing control and giving responsibility to the pupils. The reconstruction and reflection suggested that a lot more issues for investigation. What kinds of teacher interventions help or hinder the development of enquiry skills? What would the pupils' views be on these lessons? Do particular techniques and difficult data have to be introduced in a more controlled way? Do pupils who are unused to an enquiry approach need to be introduced to it in a controlled way? Does working in a framed way inevitably take more time than working in a closed way? Does enquiry always need so many resources prepared in advance?

A crucial aspect of 'action research' was missing from the investigation; the PGCE students investigated an issue which was raised by the tutor. If students teachers are to promote their professional development they need to ask their *own* questions and investigate their own practice. If the experience was a success they would, in future, see their own teaching as an activity to investigate and improve through action research.

7.4 Student material

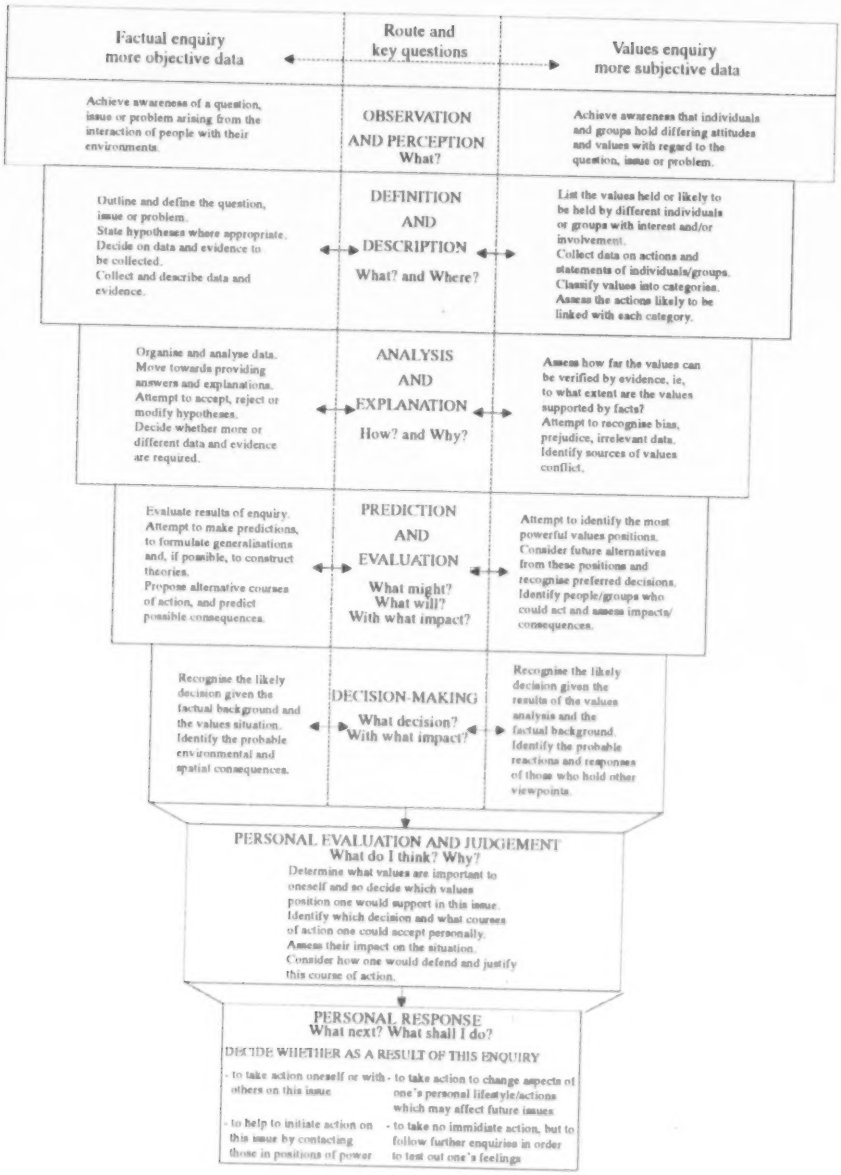
Factual enquiry
more objective data
Route and
key questions
Values enquiry
more subjective data
Achieve awareness of a question, issue or problem arising from the interaction of people with their environments.
OBSERVATION
AND PERCEPTION
What?
Achieve awareness that individuals and groups hold differing attitudes and values with regard to the question, issue or problem.
Outline and define the question, issue or problem.
State hypotheses where appropriate.
Decide on data and evidence to be collected.
Collect and describe data and evidence.
DEFINITION
AND
DESCRIPTION
What? and Where?
List the values held or likely to be held by different individuals or groups with interest and/or involvement.
Collect data on actions and statements of individuals/groups.
Classify values into categories.
Assess the actions likely to be linked with each category.
Organise and analyse data.
Move towards providing answers and explanations.
Attempt to accept, reject or modify hypotheses.
Decide whether more or different data and evidence are required.
ANALYSIS
AND
EXPLANATION
How? and Why?
Assess how far the values can be verified by evidence, ie, to what extent are the values supported by facts?
Attempt to recognise bias, prejudice, irrelevant data.
Identify sources of values conflict.
Evaluate results of enquiry.
Attempt to make predictions, to formulate generalisations and, if possible, to construct theories.
Propose alternative courses of action, and predict possible consequences.
PREDICTION
AND
EVALUATION
What might?
What will?
With what impact?
Attempt to identify the most powerful values positions.
Consider future alternatives from these positions and recognise preferred decisions.
Identify people/groups who could act and assess impacts/ consequences.
Recognise the likely decision given the factual background and the values situation.
Identify the probable environmental and spatial consequences.
DECISION-MAKING
What decision?
With what impact?
Recognise the likely decision given the results of the values analysis and the factual background.
Identify the probable reactions and responses of those who hold other viewpoints.
PERSONAL EVALUATION AND JUDGEMENT
What do I think? Why?
Determine what values are important to oneself and so decide which values position one would support in this issue.
Identify which decision and what courses of action one could accept personally.
Assess their impact on the situation.
Consider how one would defend and justify this course of action.
PERSONAL RESPONSE
What next? What shall I do?
DECIDE WHETHER AS A RESULT OF THIS ENQUIRY
- to take action oneself or with others on this issue
- to help to initiate action on this issue by contacting those in positions of power
- to take action to change aspects of one's personal lifestyle/actions which may affect future issues
- to take no immidiate action, but to follow further enquiries in order to test out one's feelings

Figure 7.1 *The route to enquiry*

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← CLOSED	FRAMED	NEGOTIATED →
Content	Tightly controlled by teacher. Not negotiable	Teacher controls topic, frames of reference and tasks; criteria made explicit.	Discussed at each point; joint decisions.
Focus	Authoritative knowledge and skills; simplified monolithic.	Stress on empirical testing; processes chosen by teacher; some legitimation of student ideas.	Search for justifications and principles; strong legitimation of student ideas.
Students' Role	Acceptance; routine performance; little access to principles.	Join in teacher's thinking; make hypotheses, set up tests; operate teacher's frame.	Discuss goals and methods critically; share responsibility for frame and criteria.
Key Concepts	'Authority': the proper procedures and the right answers.	'Access': to skills, processes, criteria.	'Relevance': critical discussion of students' priorities.
Methods	Exposition; worksheets (closed); note giving; individual exercises; routine practical work. Teacher evaluates.	Exposition, with discussion eliciting suggestions; indiv/group problem-solving; lists of tasks given; discussion of outcomes, but teacher adjudicates.	Group and class discussion and decision-making about goals and criteria. Students plan and carry out work, make presentations, evaluate success.

Figure 7.2 The control framework

Stage of enquiry	Closed: choices made by teacher	Framed: strategy chosen by teacher to enable some pupil choice	Negotiated: choices made by pupils
Posing the questions of the enquiry			
Finding the data to answer the enquiry questions			
Using the data to investigate the questions			
Reaching conclusions			
Evaluating the enquiry			

Figure 7.3 *A framework for investigating the teacher's role during the enquiry process*

List of resources included in the June 1992 Decision Making Examination Paper for the Advanced Level Geography Examination, Syllabus 9219 of the University of London Examination and Assessment Council.

1 A letter to a pupil welcoming him/her to a hypothetical a study project in the South of France to devise a management plan for the area near Pont du Gard, near Nimes.
2 A Location map of the district.
3 An I.G.N. (Institute Geographique National) 1:25,000 map extract.
4 An annotated field sketch of the features of the Pont du Gard.
5 Paragraphs giving the views of visitors, residents and specialists.
6 Information on traffic volumes and visitor numbers.
7 A set of photographs showing context and problems.
8 A detailed site map.
9 An outline base map.

Figure 7.4 *Resources provided for a decision making examination paper: an example of resources for a classroom enquiry.*

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8 CONCEPT MAPPING IN GEOGRAPHICAL EDUCATION IN NIGERIA FROM THEORY INTO PRACTICE

Julie Okpala

8.1 Introduction

Geographical education in Nigeria has experienced curricular changes in order to improve teaching and learning. One major problem which has been consistently identified in the teaching of geography in secondary schools is that the curriculum is too wide to be covered effectively within the time available for geography. Another is that performance in external examinations is unimpressive (Okpala 1983; Eze 1986; Okoye 1995). Concerning time within the current three-year Junior Secondary (JS) and three-year Senior Secondary (SS) educational system, in which geography is merely introduced within Social Studies at the JS and taught as a separate subject at the SS, the curricular prescription at SS is two hours of geography per week. Studies in the field reveal that in most schools the actual time spent is one hour twenty minutes. Teachers therefore have to adhere to the traditional teacher -oriented methods in order to cover the specified content. The methods of teaching which teachers have therefore adopted are note dictation, talk chalk (expository) and giving class prefects notes to copy on the blackboard for other students to copy (Okpala 1983).

Geography educators in Nigeria have recommended ways of improving the learning of geography. These include problem solving (Okpala 1987) and games and simulation (Okoye 1995). It has not occurred to them that, in the final analysis, the way students organise ideas (make notes) is essential for understanding, remembering and application of knowledge. Good notes provide easy-to-read outlines to the learner, ensure understanding, aid application of knowledge, increase thinking flexibility, enhance linkage, and make revision and writing considerably easier (Oyenokan 1984).

Observation of students' notes in geography in Senior Secondary Schools in Nigeria shows that the notes are voluminous and that revision is consequently tedious. A typical note on the topic of the Solar System has 1,300 words, excluding numbers. The content areas are: names of planets, distances from the sun, nature of the sun and the planets, and proof of the sphericity of the earth. At 250 words per page without figures, this topic covers approximately five pages. The volume of notes which geography students accumulate and are expected to read for the certificate examination can be imagined if this topic, in relation to the whole curricular content, is only a drop of water in the ocean. With the obvious ineffective conceptualisation of this voluminous content, academic achievement in geography is bound to be poor, as has been documented (Okpala 1987; Okoye 1995).

Notes are an important issue in geography education because they make a greater impact if they are made rather than taken. Note-taking implies that the student could put down the ideas word for word, while note-making involves sifting relevant ideas from a presentation

for remembering and utilisation in future. Unfortunately, the practice in geographical education in Nigeria is note-taking rather than making.

8.2 Theory

The concepts of cartographic communication and theory of assimilation (Ausubel 1963) of cognitive learning are essential for improved note-making in geography. Cartography is the science of map making. Map making involves putting down an experience or idea in a bounded graphical form. Basically, an area or region once mapped is a known area and therefore is no longer "terra incognita but terra cognita". To map therefore means to know. This idea was confirmed by Robinson who saw mapping as a combination of the reduction of reality and the construction of analogical space (Wandersee 1990). This enables the knowing of a structure which would have otherwise remained unknown. This idea is in line with the cartographic communication process (Guelke 1976) which stresses information encoding and decoding.

When a map is made, the map-maker encodes the appropriate cartographic information. The process of reading a map involves decoding such information; that is, giving meaning to it. This decoding involves a chain of cognitive processes including recognition, discrimination and estimation. If encoding and effective decoding of a map indicate effective thinking and conceptualisation, they therefore imply that an ability to map out ideas would facilitate conceptualisation. This is because maps as concepts, are complex and interrelated ideas.

The assimilation theory of cognitive learning (Ausubel 1963) explains that new concept meanings are acquired through assimilation into concept propositional frameworks. In supporting this theory, Novak (1990) added that the basic framework of organisational structures is hierarchical and:

> *"most new learning occurs through derivative or correlative subsumption of new concept meanings under existing concept propositional ideas" (Novak 1990, p. 938)*

This situation involves the structuring and restructuring of meaning in the light of past experiences, current preoccupations and their future intentions (Ghaye & Robinson 1989). The structural framework is not simple but complex, as it is not a mere noting of factual information but is a conceptual structure which combines high order processes. It concerns the way children under certain situational and task-related influences organise and reconstruct these knowledge structures. It involves making meaning as a result of grasping major ideas and interrelationships of ideas and procedures in order to make them into a comprehensive whole. This meaning making is critical and central to the process of teaching and learning (Ghaye & Robinson 1989). Thus, the teaching-learning processes which are appropriate are those which enable the child to develop a range of meta-cognitive skills. Meta-cognition (Ghaye & Robinson 1989) is the ability to reflect upon how one learns and ultimately perhaps the ability to respond to the demands of the task-in-context more appropriately and richly. Meta-cognitive skills come into play in situations such as the utilisation of ideas for solving real-life problems and the culling up of ideas in tackling evaluation tasks (e.g. answering examination questions).

By the nature of geography as a bridge between the arts and the sciences - an environmental science with enormous and ever-increasing problems and issues to be learnt - together with the fundamental concepts, there is bound to be an enormous accumulation of information. The fundamental need therefore arises of how geography students may be helped to understand, reduce and record the voluminous information during geography lessons to a form which can be conveniently understood and utilised for the purpose of responding to demands.
Teaching by note-making has been found to lead to improved academic achievement by under-achievers (Robin et al. 1984). Note-making has been recognised as an important variable in learning. Robinson (1982) reported findings which showed that good quality notes with points more clearly identified and with less wording, produced better student performance. If verbosity in information has an impact on what is subsequently retained, it could be reasoned that a search for strategies which would reduce the volume of notes in geography and enhance the understanding of concepts in geographical education becomes necessary.

8.3 Methods

A method of teaching and learning which has been explored in various fields and found to enhance meta-cognition is the use of concept maps. Concept mapping (Wandersee 1990) is a meta-learning strategy based on the theory of meaningful learning. It is an instructional method in which an attempt is made to note the important concepts and the facts and ideas related to them hierarchically in a bound graphic form. Novak & Gowin (1984, p. 15) described it as;

> *"a schematic device for representing a set of concept meaning embedded in a framework of proposition".*

Concept mapping was first tried out at Cornell University in 1984. It was developed as a result of the search for a means of assisting pupils to learn science meaningfully. In making concept maps, linear information is changed into key ideas in a sequential and hierarchical arrangement. A concept map is made up of concept ideas interconnected with lines showing relationships. Appropriate words (verbs, adverbs, prepositions and adjectives) are used to describe such relationships where necessary.
Scientists, in an attempt to enhance the understanding of scientific knowledge, have extensively researched and explored the use of concept mapping in science teaching and texts (Stewart et al. 1979; Novak & Gowin 1984; Ault 1985; Jegede et al. 1990; Novak 1990; Ezeudu 1995; Udofia 1995). These works confirm that improved and meaningful learning occurs in classrooms where concept mapping is employed. Studies with trainee teachers (Beyerbach 1988; Beyerbach & Smith 1990) show that with the use of concept mapping, their ideas become better organised, and concepts more differentiated and hierarchically organised. In the area of science, concept mapping has been accepted as a strategy for more effective communication of concepts to learners when compared to the conventional lecture method. It has also been found to provide an effective map-mind for learning and has reduced examination anxiety (Jegede et al. 1990). The issue for consideration at this point is whether con-

cept maps can be useful in learning geography which had previously been learned in a linear fashion.

8.4 Materials

Concept mapping is a strategy for teaching which has been highly recommended in science teaching but is rarely utilised in geography classrooms. Novak (1990, p. 946) in reporting on the efficacy of concept mapping in understanding concepts wrote,

> *"In the one and a half decades in which we have worked with this tool, we have not found any subject matter domain that is not amenable to representation with concept maps. Considering the already ascertained efficacy of this strategy, one might straight away recommend it for use in geography classrooms. But one should note that the attitude of teachers to any new strategy is important to its utility in practice."*

In order to sensitise trainee teachers towards concept mapping for geography lessons, 35 in service trainee teachers of Geography and Social Studies at the University of Nigeria, Nsukka, were taught the use of concept maps during the methodology course and two Social Studies courses. They made their notes using concept maps and also used them in their demonstration lessons. At the end of the contact, they were given a 16-item attitude questionnaire on a four-point rating scale (Strongly Agree, Agree, Disagree, Strongly Disagree). The purpose was to ascertain the perception of the in-service trainee teachers on the usefulness of concept maps to them:

1 as trainee teachers, in understanding concepts and in meaningful note-making; and
2 as teachers, in teaching their students for meaningful learning.

The numerical values 4, 3, 2 and 1 were assigned to the ratings respectively. The means of the ratings for the individual items and overall were calculated. The value >= 2.50 was an indication of positive response to concept mapping.

The overall mean obtained on concept mapping as a note-making strategy for in-service trainee teachers was 3.2. The teachers therefore agreed that concept mapping would be useful for effective teaching of geography and social studies. On using concept maps in making notes as students, the highest mean ratings of 3.7 were obtained in two areas: it made recall of lectures easy and made learning enjoyable. Other high ratings were: it encouraged creativity (3.6) and made lectures clearer (3.5). Concerning use of concept maps to them as trainee teachers, they strongly agreed that concept mapping would be useful in teaching their students in the field (3.7) and they were eager to use concept maps in teaching their students (3.2) and to use concept maps in peer teaching (3.1).

The results reported above show that the teachers in the in-service degree programme involved in the study concept-mapped their notes in the methodology course. They also used concept mapping in preparing their notes for peer teaching. Two concept maps produced on the former and latter are shown respectively in Figures 8.1 and 8.2.

These trainee teachers are expected to utilise concept mapping in teaching their students in the field within the year of practice, and during the teaching practice which will be supervised

by the staff of the department who are now knowledgeable in concept mapping. This strategy will be extensively utilised in teaching these trainee teachers during the next contact. Subsequent groups of trainee teachers will also be taught using concept maps in the methodology and Social Studies' courses.

The utilisation of concept mapping in teaching the methodology course to these trainee teachers is in line with the idea of theory into practice in teacher education (Cookey 1964; Graves 1978; Carter 1981; Slater & Pask 1981; Okpala 1983). These authorities argue that whatever strategies trainee teachers are expected to use in teaching in the field should also be utilised by teacher trainers when teaching them the methodology course. The action research reported in this paper on concept mapping is an attempt to avoid the known criticism that most teacher education programmes contain lofty ideas which include modern procedures, and that such ideas are not feasible and practicable in the teaching field.

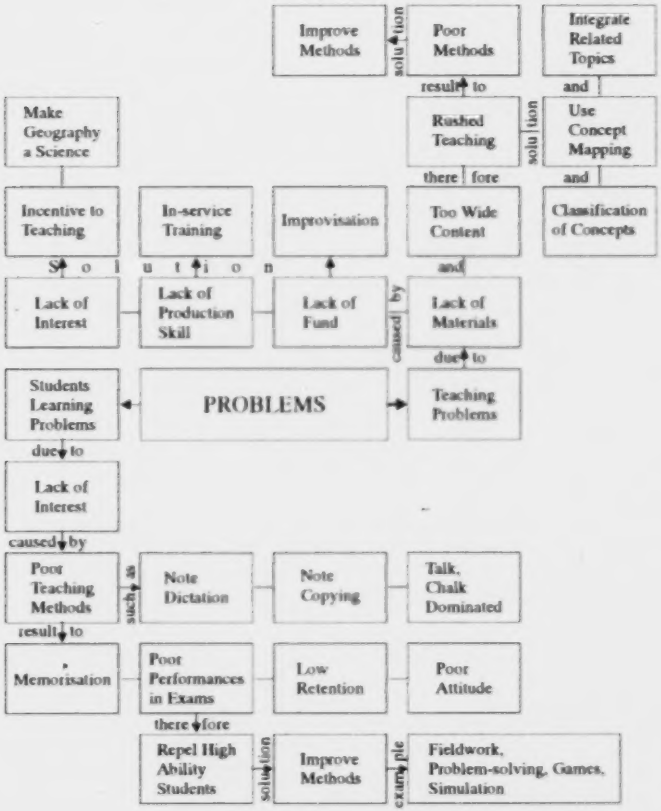

Figure 8.1 *Problems of teaching and learning geography in secondary schools in Nigeria*

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The ideal situation is that whatever methods trainee teachers are expected to utilise in teaching in the field should also be tried out with them at college. The practice on concept mapping reported above is only the beginning of a series of pieces of action research which hopefully would lead to the use of concept maps in geography classrooms for enhancing the process of conceptualisation.

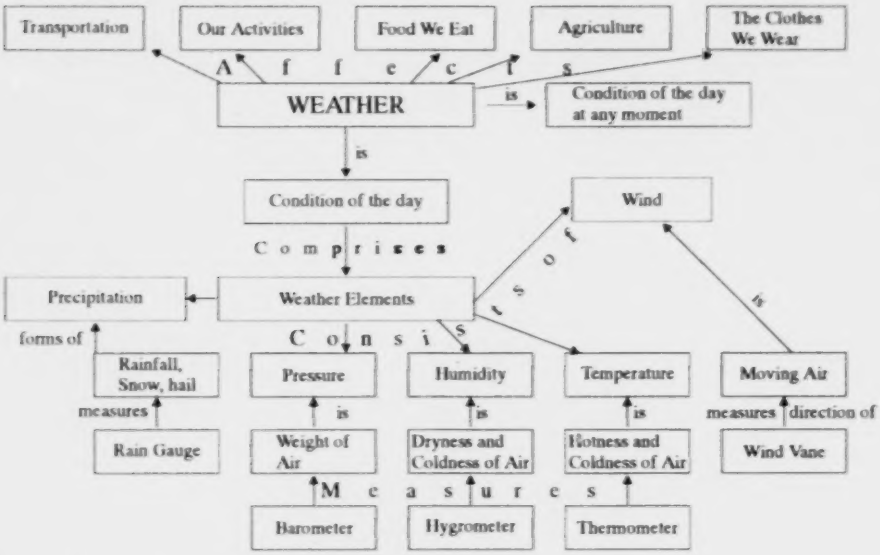

Figure 8.2 Concept map for junior secondary social studies

8.5 A final word

Mapping of concepts as a strategy in teaching and note-making has been found to enhance understanding, academic achievement, retention and to promote a positive attitude in the sciences at various educational levels. But it seems that geographers, who were the originators of cartographic
communication, have only minimally explored the efficacy of concept mapping in enhancing conceptualisation and interest in the subject. This paper reports a precursor of the use of concept mapping in geography classrooms by introducing it to in-service trainee teachers. Fortunately these teachers expressed positive attitudes towards this strategy and are willing to utilise it in their teaching. As follow-up action is taken through contact and supervision to further monitor the utilisation of this strategy by the students in the field, it should be noted that this is based on the assumption that as concept mapping is beneficial to the learning of the sciences (biology, physics, chemistry) that it would also be beneficial in geography as geography is also a science. Despite this assumption it should be noted that there is a dire

need for in-depth empirical (experimental) work in order to specifically ascertain the need for and the limits of using concept maps in geography classrooms. Some examples of topics for research are, the effects of:

1 concept mapping on academic achievement, retention and interest in geography;
2 concept mapped texts on academic achievement, retention and interest in geography;
3 concept maps as advance organisers on academic achievement, retention and interest in geography;
4 concept mapping in audio-tutorial and multimedia geography lessons on conceptualisation and interest.

These studies are necessary in order to confirm the efficacy of concept maps in helping students learn how to learn through geography. As many problems of geography teaching, including conceptualisation, are experienced internationally (Gerber & Lidstone 1988), the effectiveness of concept maps in geography classrooms needs to be investigated across geography classrooms in a variety of countries. This could be achieved for example through an internationally coordinated research programme of the Commission on Geographical Education of the International Geographical Union.

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SECTION B

OLD AND NEW MEDIA

OLD AND NEW MEDIA: INTRODUCTION

Henk Trimp

Since all information is conveyed through a medium, we need media to acquire knowledge and skills. Geographical education has long been known for it's use of a wide range of different information carriers including voice, blackboard, book, model, poster, whiteboard, overhead transparency sheet, slide, film, video and computer disk.
The above list is roughly ordered chronologically from 'old' to 'new' media. Where the line betweeen old and new is drawn is debatable and subject to historic change. In common parlance, the term new media was for many years connected with the distinction between hardware and software. Once you could distinguish clearly between the machine (for instance, a projector) and the information carrier (for instance a slide or videotape). Nowadays (1996) the teacher who thinks he is introducing new media when he rolls in an overhead projector is bound to be regarded as old (-fashioned). Only the use of a computer is regarded as new and even then it depends on the type of computer and the type of use made of it whether one is really 'hot'. Ironically, in the 'newest' media (multimedia or hyper media) the distinction between hard- and software is getting blurred. It is difficult to know hard from soft once you are on the 'electronic highway'. In cyberspace these differences fade until in virtual reality once again, the 'medium is the message'.
Since the beginning of history (or at least since the beginning of verbal communication) old and new have been relative terms and this will be so until the end of time. Cruising the electronic highway as we now know it will be ancient history for pupils of 2020. On the other hand, the human voice and the use of (whatever) language will most probably survive all new technological waves. So although the words 'old' and 'new' may indicate the timelag between invention and the here and now, they can never be used as synonyms for words like out-of-date and modern.
The contributions in this section will underline this last statement.

In chapter 9 Lester & Slater focus on textbooks in their study of the role of language in learning. Textbooks, still being the most widely used means of communication in education, are very up-to-date, and the study by Lester and Slaters is even more so, since their findings are easily transferable to every conceivable medium that may technologically be more advanced. The concept of 'audience' is crucial in communication and the authors argue that language can help to clarify for any audience the use of different types of discourse such as narrative and academic. Once the transition from narrative to academic language has been made explicit the student has to be made aware of the limitations of the author in the presentation of the academic argument. This active authorial intervention (metadiscourse) helps the student to grasp the affective meaning of history and geography.

John Chi-Kin Lee argues in chapter 10 that teaching mixed ability classes is one of the main challenges of our time. He stresses the value of the use of graded worksheets to give proper attention to all pupils and to facilitate them to stretch their abilities and develop their own

potential. Although this contribution also focuses on one medium (the worksheet), its findings are relevant to other media like textbooks and audio-visual aids. To put it in 'modern' terms: the worksheet could be regarded as an 'agent' to provide different scope, pace and/or amount of reinforcement for different kinds of pupils, regardless of what other media they use.

A combination of the old and new is the central theme in chapter 11. Christine Kim-Eng Lee explains that whatever medium you use, classroom organization is crucial if we want to reach our educational aims. She stresses the importance of cooperative learning (students working in small groups to help one another to learn) as opposed to competitive and individualistic learning. Although computer work traditionally caters for individualised instruction, it can be turned around to be part of a 'group learning environment'. Whether this is called a Group Investigation Model (Dewey) or a Student Team Learning Method (Slavin), central themes will be positive interdependence and individual accountability. By combining the powers of computer simulation with the benefits of cooperative learning a significant step towards attaining higher level educational goals can be made.

Finally, Albrecht provides us in chapter 12 with a bridge to the next section by applying computer simulation to an environmental issue: the geo-ecology of the Alps. A simulation program (GeoLab) is used to show the effects of land-use decisions on ecological factors and their related spatial processes. By experimenting with the variables as well as with the model itself the student gains insight into the geo-ecological processes and also into the method of knowledge acquisition (metacognition). This contribution challenges us to consider the possibility that, for certain educational goals, 'old' media may not suffice and we will need the new -maybe overestimated but nonetheless extremely useful- means of interactive communication.

9 READER, TEXT, METADISCOURSE AND ACADEMIC ARGUMENT

Alan Lester and Frances Slater

9.1 Introduction

From beginnings in the late 1960s, work on the role of language in learning has continued to develop (Barnes et al. 1969, Britton 1970, Open University 1972, Martin et al. 1976, Barnes 1976, Sutton et al. 1981, Hull 1985, Burgess et al. 1993). The initial research relating language to learning processes began to filter through to those in geography teaching in the early to mid 1970s and was published in Williams (1981) and Slater (1982). This research has demonstrated that language not only functions in classrooms and elsewhere to *communicate* what is being learned, it is also part of the *activity* of learning.

In the early work, the concept of audience was central (Piaget et al. 1959, Vygotsky 1962). It was further explored by Harding (1963), Halliday (1973), Martin et al. (1976) and others. Varying the audience and varying at the same time, the purpose of a piece of writing, was linked to increasing opportunities for learners to arrange and rearrange concepts and ideas. Stages in the thinking, talking and writing processes, from exploratory and draft through to a finished or transactional expression in the appropriate genre, were isolated and taken up in geography education (Slater 1989).

Specific research within the MA programme in geography education at the Institute of Education, University of London, supports the view that audience related writing does have a notable affect on the learning processes that children experience. Audience related research in turn represents a first phase in language related research in geography education (Slater 1989, Butt 1993).

As an understanding of the role of language in learning diffused amongst geography teachers and those writing geography texts (Slater 1982, 1991, Bunce 1994), English teachers were shifting their interest to an examination of how students meet the writing of others in texts (Lunzer & Gardner 1979, 1984). It was a shift from helping students develop their own understanding and writing abilities to theorising about how students understand others communicating with them. Essentially the focus was on reading and learning to read (Smith 1971, 1982). One of the earliest researches in this area of direct relevance to geography teachers was by Robson (1983), reported in Slater (1989). Robson should be consulted carefully for the research results she provides on 'A' level students meeting a text and the difficulties they experience arising from the lack of metadiscourse signs provided by the author. This is at present the only research of its kind relating to geography and student comprehension or incomprehension as the case may be. It is intended that the extracts offered in 9.4.2 will be subject to further research. This will reveal the helpfulness or not that students find from using a deliberately and carefully metadiscoursed text in historical geography. This research and its possible development represent a frontier in geography education research.

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One strand of the role of language in learning research has been premised on the notion that varying the audience to which learners address themselves is crucial in assisting the learning process. A second strand shows concern for a better understanding of how learners make sense of the texts written for them as audience. The concept of audience is central to both strands. In the first learners are given an audience to write to, in the second they are the audience addressed appropriately or not as the case may be. Preliminary work by Slater (1991) and recent research by Lester (1995) takes the research in geography education into the second strand and provides an opportunity to explore student reaction to texts in more depth.

9.2 Theory: readers and texts

Textbooks are a particular genre, they serve the specific purpose of formal educational instruction. Their message though, like that of any text, is encoded in style and linguistics and they, like any other text, are directed at certain 'implied', or alternatively, 'intended' readers (Iser 1974; 1978). The whole question of an appropriate style for the intended readership arises, and we wish to argue that it needs to be addressed explicitly.

'Genre theorists' such as Kress & Threadgold (1988), Martin (1989), Reid (1988) and Threadgold (1988; 1992) point out that the general induction of students into the language of 'adulthood' involves an appreciation of how language is moulded in various genres, such as narrative, reporting, description and exposition. Robson (1983), found that unfamiliarity with the language of academic enquiry alone inhibits the understanding which many students are expected to derive from textbooks.

The language of most texts is described by Crismore (1989), as "textbookese". It rests on the perception of author as objective purveyor of information to student. Textbookese involves little liveliness, little emotion and certainly no direct authorial intervention and guidance in the text. It is, according to Hull (1985), sterile - an extraordinary written language contrived especially for educational purposes. As a discourse of its own, textbookese is premised on a set of assumptions about the relationship between readers and texts.

This relationship is held to consist of a flow of information from author to reader (Thorndike, 1971). The reader is conceived as an empty vessel waiting to be filled with the insights of the text. Any misunderstandings which are engendered by texts simply reveal mistakes on the part of readers which can be corrected by guided reading techniques (Lunzer & Gardner 1979). But Robson (1983) makes the point that it is not misguided reading strategies, but the disjunction between the language of textbookese and that to which students are accustomed in more familiar forms of discourse or genre, which most frequently prompts misunderstanding.

A more realistic representation of the relationship between readers and texts is that of texts being interpreted in the light of the past experience of each individual reader. In effect, the text "offers guidance as to what is to be produced, and therefore cannot itself be the product" (Iser 1978, p. 107). It is this which accounts for the multiplicity of interpretations which different students can derive from the same text, rather than simply their different reading competencies.

A more successful text then, would not deliver an academically styled presentation of 'facts' and interpretations 'from on high', but would attempt to touch pre-existing student understandings and then extend them through a kind of partnership between author and reader. In particular this partnership is geared towards introducing student readers to the conventions of academic writing. If student textbooks do not actively teach academic discourse, no other academically-written books are likely to. To be appropriate, a student text must teach actively, not just about its specific subject matter, but about the language of academic discourse in general.

Academic discourse has certain unwritten rules and assumptions. It is a language with which most students are perpetually battling to come to terms. The most common structure of language found in academic writing is argumentative. In other words, various propositions relating to the subject of enquiry are put forward and an argument for or against them is constructed.

Some pieces of academic writing (for instance, many journal articles) make only one proposition and then attempt to convince the reader of its validity by providing supporting evidence. Even here though, the piece is argumentative in that the new argument of the writer is contrasted with a previously accepted version. The argument occurs through the fact that an orthodoxy is being challenged. For example, Wolpe (1972) builds up an argument that apartheid in South Africa was the state's response to the need for cheap labour, so that capital could continue to make profits despite the collapse of African reserve economies. Here, the orthodoxy being challenged was that apartheid was an ideologically inspired Afrikaner nationalist project.

The key point is that this argumentation can best be achieved through a particular use of language. As a structure of language in its own right, argumentation is associated with certain words and phrases. As one becomes more familiar with the structure, these words and phrases tend to be used more frequently in order to make propositions and arguments clearer. Thus it sometimes helps in an essay to be very specific, writing: "*I am arguing that ...*". Often, a whole series of connected propositions needs to be made to build up an argument. If this is the case, words like "*therefore*", "*thus*" and "*hence*" are useful. When contrasting points of view or providing evidence against a certain proposition, "*however*" is often employed. "*Nevertheless*" can be used to defend a proposition in the face of evidence which has been directed against it, as can "*despite*".

For example (itself a term which can be used to provide evidence for an assertion), Wolpe's argument can be challenged in the following way (words which denote an argumentative structure are italicised)

> Wolpe's assertion that apartheid provided cheap labour power for certain sectors of capital is, broadly, correct (at least, it was until the late 1960s). *However*, this does not necessarily signify that this was the government's intention in the formulation of apartheid. *While* the benefits to capital may have been a significant consideration in favour of consolidating legal segregation, early apartheid legislation was passed primarily in the material and ideological interests of an Afrikaans political constituency comprised of farmers, miners, 'poor white' workers and small Afrikaner capitalists. In this sense, it was a political programme more than it was an economic

programme. *Indeed*, such was the explicit assertion of 'the architect of apartheid' himself, Verwoerd, who stated that ..."

Apart from the specific words which have been emphasised, note that the general structure is one of a series of assertions: "While the benefits to capital may ... early apartheid legislation *was* ...". Here, the "was" is an assertion of 'fact' in contradiction to that of Wolpe's.
Many students, of course, are perfectly capable of reproducing argumentative language in their own writing. Others though, particularly those who have had less experience of reading in general, tend to fall into one of two pitfalls, which can be considered as extremes laying on either side of an established approach. The first is to ignore academic convention and write in the structures of everyday language, sometimes using colloquialisms and slang. This is to overlook the fact that academic writing has its own structure. The second pitfall is to try too hard to use 'impressive' language. Long words are used in not quite the right context and overblown sentences are constructed, seemingly with no point to them.
The discourse type which is most familiar to most students will be narrative (at its simplest, story-telling - see Egan 1989). Psychologists have explained that, once a certain discourse becomes familiar, a 'structure' develops in the mind which enables it to be recognised time and time again. Thus, "once we identify a text as an instance of a pattern, we happily dispense with the mass of its detail and reduce it to the skeletal shape of the familiar pattern for purposes of longer-term memory and recall" (Fairclough 1989, p. 160).
In this scheme, the problem that many students have with the academic discourse of texts would stem from the fact that this is not a recognised discourse - there is no pre-existing mental structure attuned to this form of language which would facilitate assimilation of content. Students have to be explicitly introduced to this form, and effectively taught it, if they are to make sense of textbooks. The key point is that the textbook itself can assist in this process, and one does not need to assume that the student mind consists of "stereotyped data structures" (Smith 1982), to accept that textbooks should introduce and teach about their very language as well as their subject content (which is, of course, inevitably contained within that language).

9.3 Methods

If one accepts this, the obvious starting point for a text is the form of discourse with which student readers are likely to be most familiar - narrative. The text should begin with a story. The story is international, transhistorical, and transcultural. This is where the student text is most likely to touch on pre-existing reader competence. Part of Egan's (1989) definition of narrative is that it leaves the reader with an affective meaning. Once the story is told, the reader should know how to feel about it - should be able to relate its specifics to the wider concerns of human consciousness and the human condition. It is this which makes narrative such a powerful tool for the transmission of human culture, and which therefore makes it so familiar even to those without formal education. And here, there is a rationale for the explicit treatment of theoretical contention in the historical or geographical text. The Marxists and liberals who have contributed to South African historiography, for instance, have each at-

tempted to define the affective meaning of South African history. For Marxists, the story of South African social development betrays the materialism which lies at the root of human social action, while for liberals, the meaning of the story hinges more on the diffuse parameters of group formation - ethnicity, nationalism and race being the most prominent. If students are introduced to the debate, alternative meanings to South African history can be posited for them.

But this involves an extension of discourse. The text begins with narrative, but, paradoxically, if it is to consider theoretical dispute as an affective meaning behind the narrative, it must branch out into another discourse - that of academic argumentation. This, as the findings of the literary psychologists suggest, must be an explicit transition - one into which students are guided. And this in turn means *metadiscourse*.

Metadiscourse is the direct intervention of the author in the text, for example, to warn of what is coming, or to prompt particular consideration of salient passages. If, through their reading of the text, students are to learn simultaneously about its subject content and its discourse, they must be guided in that learning. That is, they must be given assistance in the recognition and utility of academic, argumentative discourse. Iser notes how the authorial intervention which characterised the 18th century English novel has now disappeared, leaving the modern reader "deprived of the assistance which the 18th century writer had given him in a variety of devices ranging from earnest exhortation to satire and irony. Instead, he is expected to strive for himself to unravel the mysteries of a sometimes strikingly obscure composition ... the world presented seems to have no bearing on what the reader is familiar with" (Iser 1974, p. 102). If this is so for mature novel readers, there must be even more of a case for a move away from the absent author in textbooks for students.

By narrowing the gap between textbook discourse and the reader's own expectations, metadiscourse (as long as it is not so intrusive as to be irritating) facilitates student 'translation' of the text and therefore minimises the risk of misunderstanding. In order to undermine the impression of authorial objectivity and authority, metadiscourse can further be used to indicate that the writer is, like all other instructional writers, presenting informed opinions, rather than any objective truth.

To summarise, in an appropriate student text, there is a broadly narrative structure, but within this structure, other forms of discourse, such as argumentation are 'taught'. Poles of interpretation are subtly counterpoised in the narrative, and between these poles, the reader is guided explicitly, but not too obtrusively, by authorial intervention, towards the understandings that the writer considers appropriate. There are, however, signposts along this route to warn the reader of the author's own ideology and to indicate that others are possible.

9.4 Student material

9.4.1 Audience related writing

Audience related talking and writing opportunities have been specified in a number of texts (e.g. Slater 1986; 1991). Beginning teachers may like to randomly assign a class to an audience related task and a more conventional exercise on the same topic. The responses pro-

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duced by pupils could then be analysed to compare the quality of the knowledge and style of expression produced. The analysis could be submitted to a list of selected criteria. Audiences which provide a range of purposes and make more room for expressive, exploratory language as an essential stage on the road to understanding can be found in Slater.

The assumption behind audience related talking and writing tasks is that it reduces the number of times pupils are writing for the teacher as examiner. Under the latter conditions, the focus of the writing can narrow and become stilted and there are few opportunities for trying out ideas and then revising themes. A variety of audiences may free up thinking and writing skills and achieve a wider exploration of ideas and perspectives and styles of writing. Pupils need to be encouraged, in writing for any audience, to draft out what they want to say several times. In this way, they can move through the first stages of the writing process when ideas are being explored, thought through and expressed imperfectly (in draft), to a stage when the writer knows exactly what she/he wants to say and expresses this clearly and appropriately in a form likely to be understood by the audience being addressed. A communication can be successfully 'transacted' between author and audience. Writing moves from the hesitant exploratory draft stages through to the finished transactional stage.

Recently a text has been produced which sets each chapter around a writing exercise (Bunce 1994). This device was originated when the named author of the text was a Research Officer in the Geography Curriculum Development Unit of the Institute of Education. Frances Slater suggested in the numerous planning sessions that, not only could audience related tasks be set within chapters, but chapters could be designed and resourced to support audience related writing tasks. Here, we are going a stage further, using the concept of audience and a writing task as the central focus for the organisation of a topic or theme and as a perspective from which pupils could approach the chapter.

Providing an audience for talking or writing tasks addresses the development of speaking and writing skills. But as we all know, pupils also need help with their reading. As the reader-text relationship began to be addressed, research extolling narration (story) as the form people first come to understand led Frances Slater to the idea that there were opportunities for encouraging pupils to view some scientific writing as a story with variables as characters. An example too long to reproduce here may be found in Slater (1991, pp. 8-13). Beginning teachers could take this account of the Norfolk Broads and randomly assign a class to the narrative highlighted commentary on the one hand and to conventional instructions for reading and note making on the other.

The concern for narrative was also preliminary to moving more coherently into metadiscourse, a device demonstrated below.

9.4.2 Extracts from a 'metadiscoursed' text on South Africa

The following section is comprised of extracts from Lester (1995) - a PhD thesis containing a student text on South Africa, written purposefully with considerations of the student as intended reader and metadiscourse in mind. Student exercises are in italics. The first extract, taken from the Foreword, contains the student reader's introduction to the concept of discourse.

... With this in view, different *discourses* - ways in which content is presented - are introduced through the text. Narrative - at its simplest, the telling of a story - is used initially to set the scene for most chapters. This discourse consists of a series of events connected by a one-sided explanation of those events. Then, less familiar types of discourse, such as academic argumentation, are introduced. Argumentative discourse can be identified by the way in which different interpretations are compared. For example: "while Thompson states that ..., Wolpe would argue that ...".

The second extract is designed to show how the simplest form of narrative - storytelling - can be used to introduce readers familiar with this discourse to complex issues.

... Something of the emerging complicated relations between Khoisan and white in the expanding colony is exemplified by the following story:

By 1738, the VOC government at the Cape had forbidden settlers to trade with Khoisan on their own behalf, since all trade was the preserve of the company ...Yet settlers often flouted the company's law, and in that year, an expedition of white settlers and their Khoisan servants set out to cross the Orange River in search of more cattle. Taking ten wagons laden with guns and ammunition, copper, beads and other trading items, the group headed for the Great Namaqua clans of Khoisan in the interior. They were shown great hospitality by these people, even to the extent of one settler sleeping with a relative of the chief! Yet, having conducted their trade and left the Namaqua camp, they ordered their Khoisan servants to return, attack the camp and carry off all the remaining cattle.

Supplied with firearms and promised a share of the captured cattle, the servants attacked at dawn, killing seven of the Namaqua Khoisan including their chief, or "captain". Pausing only to launch a similar surprise attack against another group with whom they had recently traded (in which the captain's wife and baby were shot), the party returned to the frontier of the colony. There, the white settlers deprived their servants of the cattle they had been promised and distributed them among friends and neighbours.

This story only came to light because the cheated Khoisan servants reported their masters to the authorities. How many similar incidents of white violence against the Khoisan took place, but were not recorded, will never be known. This one at least sparked a frontier war, with bands of Khoisan launching retributive attacks against white farmers. To complicate matters, the settlers themselves rebelled against the company authorities when they tried to confiscate the stolen cattle. The company neatly solved both problems by pardoning all the settlers apart from their leader, provided they joined in mounted and armed sorties (commandos) against the Khoisan.

This story indicates a number of crucial developments in the formation of a white-ruled society in South Africa.

i How does it suggest that colonists' attitudes to, firstly, the independent and secondly, servant Khoisan, had developed since the European arrival?

ii What does it indicate about Khoisan attitudes towards white settlers?

iii What does it reveal about emerging material relations (i.e. to do with money, possessions and employment) between the races?

iiii What does it show about the structures of authority in the VOC-run Cape Colony?

You could think about these implications individually and then compare notes to get a more rounded view of the incident...

The next extract demonstrates an explicit introduction, guided by the author, to academic argumentative discourse:

... Since this topic is still one which arouses controversy, we will deal with it not in the form used so far - that of simple narrative (i.e. the telling of a story) - but in the form of academic argument that historians themselves use when debating it. As we have seen, the academic form of writing is concerned largely with the setting out of one or more particular arguments. An explanation for events or patterns is proposed and evidence is provided to back that explanation. Your attention has already been drawn to certain words which are very much associated with this type of writing. Here, the emphasis is on the variety of arguments that academics can sustain regarding just one sequence of events.

Encouragement for the student to move beyond narrative and use other discourses is exemplified in the following exercise. Having described a court case in which Cynthia Freeman was prosecuted for living in a white group area although she was coloured, the following questions are set:

Given the laws of the land, could you suggest an alternative defence for Cynthia Freeman?

i Write a personal account of your reaction to this court case - as if you were going to send it as a letter to the authorities.

ii Imagine yourself in Cynthia Freeman's position on the witness stand. Write out the comments that you would like to make to the court before sentencing.

Obviously, the type of language that you use will be very different in each case. Think about the appropriate style before you start writing...

The use of metadiscourse both to draw attention to argumentative discourse and to indicate that the author has a particular interpretation - one among many possible interpretations - is demonstrated in the following student exercise:

> *Revision will be made much easier if, as you read through this chapter, you state in just one or two sentences, each of the major* ***arguments*** *that is put to you in the text. Then, very briefly, list the main* ***reasons*** *or main points of* ***evidence*** *that are given to support each argument. For example, in the last chapter, a main* ***argument*** *was that Afrikaner nationalism developed in the late 19th century in response to cultural and economic threats. The* ***reasons*** *provided were the confederation policy's threat to Boer independence, the economic threat of a drift to the cities and the loss of land, and the cultural threat of Milner's post-Anglo-Boer war policies...*

Finally, an extract specifically presenting a bipolar theme to the text, thus allowing for affective meaning behind the story being told:

> The fundamental difference then, between former Marxist and liberal accounts, involved both the motivations for people's actions, and the type of groups which they formed in order to carry out those actions. Marxists saw the most basic human motivation as being the attempt to gain access to capital, and, accordingly, the most basic groups in society to be formed into classes. Liberals saw basic motivations as being ideological - to do with ethnic identity, religion, customs and race. Their social groups then, were defined as ethnic groups, religious communities or broader racial blocks. In each case, it was the interaction between these groups which shaped present-day South African society.
>
> An example from a 1970s Marxist analysis is:
>
> "Racial ideology in South Africa must be seen as an ideology which sustains and reproduces capitalist relations of production" (extracts from Wolpe 1972).
>
> And a mid 1980s liberal analysis of the same racial ideology:
>
> "Here was a dramatic intensification of the racial element that had always been part of the Afrikaner world view. A mythology that had been originally articulated for the purpose of resisting British imperialism and checking the trend toward Anglicisation had developed into a mythology for the reversal of the most dynamic forces in modern South African history - forces that were creating an industrial society out of people of diverse backgrounds and traditions" (extract from Thompson 1985).
>
> *Analyse each of these quotations. What exactly is it which makes them respectively Marxist and liberal?*

The extracts above have demonstrated how suggested exercises and active authorial intervention in the text itself (metadiscourse) can induct students into the academic discourse which so often causes them difficulties. The first step is to make the transition from narrative to this less accessible structure of language explicit: to let students know what they are up against in dealing with a textbook. The next is to ease students through that transition by offering guidance during a shift from narrative to argumentation in the text itself. Once the author is working within an argumentative framework, it is important that the student is made aware that the author's own capacities are limited to the presentation of an argument with which that author feels comfortable. Students cannot deal with academic discourse if they assume that the text itself carries ultimate authority. The task of the text is to engineer advances in awareness of a particular topic and, more than anything, that awareness stems from the ability to comprehend and trade off various interpretations. Metadiscourse and suggested exercises not only serve to introduce students to academic discourse, they also make explicit the author's own interpretation within a context of others. Only then can the affective *meaning* of history or geography become tangible.

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10 THE DESIGN OF GRADED GEOGRAPHY WORKSHEETS FOR MIXED ABILITY STUDENTS

John Chi-kin Lee

10.1 Introduction

The full implementation of nine-years of free, compulsory and universal education in many parts of the world including Hong Kong has caused mixed ability teaching to become an issue of concern. A recent study of perceived problems in junior secondary school geography teaching in Hong Kong found that difficulty in dealing with mixed ability classes and slow learners was a major cause of concern amongst geography teachers (Ho & Lee 1993). Mixed ability teaching, however, has been an issue of debate from two perspectives: whether pupils of widely varying abilities should be taught together and whether these pupils can be effectively educated alongside each other in the same class.

Furthermore, the term 'mixed ability teaching' has been subjected to diverse interpretations. Reid et al. (1981) contend that all groups of pupils, however they may be constituted, are to some degree mixed in ability however the attributes of abilities are defined. Thus any kind of teaching is, in principle, mixed ability teaching. To Reid et al. (1981, p. 7), a mixed ability class is "a teaching unit which is not streamed, banded or setted and which is in a non-selective school. The class may or may not contain pupils from a remedial department". In this chapter, the author adopts as the definition of a mixed ability class the one offered by Kemp (1986, p. 164), "any situation in which there are pupils with considerable differences of ability being taught together in one group".

There are many desirable teaching modes and strategies for mixed ability teaching. One approach is team teaching, in which teachers of different expertise can co-operate in handling pupils of mixed ability and/or may specialise in different roles of giving lectures, assisting particular groups of pupils during group work and preparing teaching resources. Another approach highlights the use of 'individualised', 'resource-based' learning and group work (Sands & Kerry 1982). Team teaching is seldom practiced in junior secondary geography teaching in Hong Kong, whilst the individualised approach represents a challenging task which may involve a complete reorientation of ideas about how teaching is organised, implemented and evaluated. In the case of geography teaching, effective mixed ability teaching should, as far as possible, provide stimulation and good learning opportunities for pupils of all abilities and involve all pupils in the group activities (Kemp 1986; Lee & Adamson 1993; 1994a).

Worksheets are common teaching resources in Hong Kong and have proved a useful solution to teaching slow learners in geography in secondary schools (Chan 1991). Leung (1992, p. 21-22) claims that worksheets are able to:

1 promote pupil participation and teacher-pupil interaction: the use of worksheets enables pupils to become active learners;

2 motivate pupils: good worksheets can arouse pupils' interest in learning;
3 consider individual differences: worksheets can provide flexibility for mixed ability teaching because they can include learning activities at different levels of difficulty and of different varieties;
4 adjust the pace of learning to a more reasonable level: worksheets can divide a lesson into relatively shorter and more manageable parts that enhance pupils' attention and help them follow the flow of the lesson more easily;
5 encourage a sense of achievement: successful completion of worksheet exercises can bolster pupils' self-esteem and self-confidence in learning;
6 promote individualised and independent learning: with appropriate arrangement, worksheets can allow pupils to complete assigned learning tasks on an individualised basis;
7 facilitate group work: worksheets can provide the basis for group discussion and student-centred activities;
8 enhance classroom management: teachers can supervise pupils more easily when they are concentrated on assigned learning tasks; and
9 supplement teaching: worksheets can supplement textbook contents, provide homework resources and guidance to accompany audio-visual presentations.

If carefully organised and designed, worksheets can thus be effective for teaching mixed ability classes.

10.2 Theory

Lloyd-Jones (1985) proposes a model of worksheet organisation for mixed ability teaching in which a common core of work is completed by all pupils. It is then followed either by remedial work and reinforcement for those less able pupils, or by extension work for the more able ones. The general pattern is to cater for all pupils by covering the topic or area of content, but with different scope, pace and/or amount of reinforcement (or extension). In this chapter, Lloyd-Jones' model integrated with the component of group work is adapted as the approach for worksheets (Figure 10.1).

10.3 Methods

Before designing the worksheet, teachers may adopt a systems approach to its design (Romiszowski 1988; Evans et al. 1991). First, teachers may need to undertake a brief curricular analysis and arrive at some instructional objectives in the light of pupils' existing abilities and interest, the topic for instruction, resource availability and other factors. Then, teachers may determine how worksheets can be used as an instructional medium in combination with other media where possible. Teachers may either adapt and modify existing worksheets or design new ones to suit pupils of varying abilities. Useful sources of textual ideas for designing worksheets are existing geography textbooks, which may have different levels of readability.

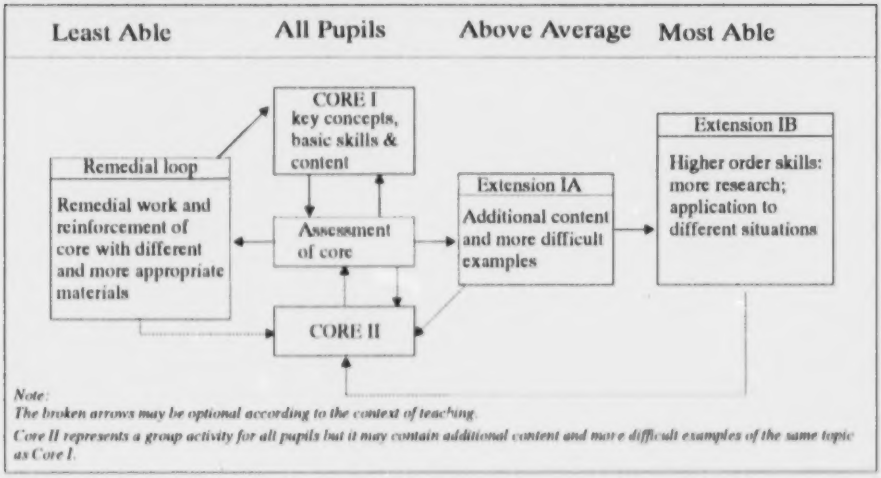
Least Able
All Pupils
Above Average
Most Able
CORE I
key concepts, basic skills & content
Remedial loop
Remedial work and reinforcement of core with different and more appropriate materials
Assessment of core
Extension IA
Additional content and more difficult examples
Extension IB
Higher order skills: more research; application to different situations
CORE II
Note:
The broken arrows may be optional according to the context of teaching.
Core II represents a group activity for all pupils but it may contain additional content and more difficult examples of the same topic as Core I.

Figure 10.1

The teacher can select text from the range of textbooks to suit the needs of individual pupils and groups within a mixed ability class (Lee & Adamson 1994b).

In designing the worksheet, the following text and visual design principles need to be observed (Romiszowski 1988). First, simple sentences and familiar vocabulary should be used as much as possible. Short paragraphs with simple logical development or text in schematic form should also be used where possible. It is advisable for exercises to focus on key terms or ideas and to include a variety of non-linguistic responses such as ticking the box, drawing, matching and ordering. In addition, new vocabulary items should be supported by explanations, exemplifications, pictures and translation as appropriate. These measures are likely to improve the readability of the worksheets. Typographical or visual design is also important for contributing to the efficiency of communication of printed media such as worksheets. In general, a spacious, neat, well-organised and colourful worksheet would enhance its own visual appearance and message delivery to the readers (Hartley 1988).

One of the key characteristics of mixed ability teaching is 'resource-based teaching'. Apart from discrete tasks, worksheets could include textbooks and their related resources, and could accompany audio-visual media such as slides and videos. In the long-run, geography teachers could consider setting up a small resource collection including worksheets for pupils to help achieve independent learning (Lee & Adamson 1993).

To make this approach feasible and successful, the commitment and effort of individual teachers should be accompanied by necessary changes in school and departmental administrative and assessment policies. It would be helpful if schools and geography teachers could adopt the principle of differentiated assessment. Moreover, the system of recording and reporting may be adjusted to a target-based student profile. This would allow teachers to keep track of pupils' abilities and progress in different profile components of a topic, such as concepts

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and skills. Pupils can also adjust better to the criteria of assessment and the expected level of attainment. This would help pupils to assume greater responsibility for their own performance. Time tabling arrangements such as having double periods for geography may also be required in order to facilitate the operation of this approach. All these measures would be likely to drive the curriculum change progressively towards a target-oriented framework, which guides teachers to decide the content and methods of teaching in order to accommodate the challenges posed by mixed ability teaching.

10.4 Student material

The following is an example of the use of graded worksheets for mixed ability teaching. Polly Leung (a pseudonym) is teaching the topic of savanna landscapes to her Secondary Two geography class.

Polly first reads the official syllabus for junior secondary geography (CDC 1983) followed by textbooks and worksheets from other schools (Wong 1990; Yan Oi Tong Tin Ka Ping Secondary School 1990).

The content of geography syllabus suggests that the topic of savanna landscape covers the following major themes: (1) Distribution and climate; (2) Characteristics and seasonal variation of natural vegetation; (3) Farming activities; and (4) Problems and solutions in developing the savanna landscape. Having considered the constraint of the need to cover the whole topic on schedule, she then decides to design graded worksheets based on selected themes, namely climate, and problems and solutions in the savanna landscape.

Polly then selects the common core, the remedial work and the extension work for pupils based on the following criteria: (1) The level of difficulty for the exercises of the common core is based on the worksheet exercises from some Band 3 (i.e. average) secondary schools, textbooks used in those schools and feedback from teachers. (2) Exercises for less able pupils are either simplified from the common core exercises or adapted from worksheet exercises used in Band 4-5 (i.e. below average) schools. (3) Exercises for more able pupils are either adapted from worksheet exercises used in Band 1-2 (i.e. above average) schools or self-designed. In terms of content, worksheets for more able pupils contain additional facts and concepts as well as covering a greater number of places. More able pupils, for example, are asked to study the climatic graphs of Kano and Darwin respectively, whilst the average and less able pupils work only on the climatic graph of Kano. More able pupils are also instructed to read a chapter on 'A quiet hunger' (Fien 1989) which introduces difficult concepts such as social justice and multinational agribusiness corporations.

Polly prepares a self-produced video album (with teacher's own explanation) for pupils to understand the physical environment of the savanna lands. She also shows a section of a video programme titled 'Breaking Ground' under the TV series 'The Global Environment' (BBC 1990), which looks at soil erosion in Kenya and steps which are being taken to prevent desertification.

Polly also produces a graded worksheet to suit the mixed ability range of her pupils. Some examples of the worksheet exercises are shown in Figure 10.2 (a-e).

Worksheet exercises for all pupils (Core I)

Study the climatic graph for Kano below, and answer the following questions:

1 What is the maximum monthly temperature?
2 What is the minimum monthly temperature?
3 What is the maximum monthly rainfall?
4 What is the minimum monthly rainfall?
5 What is the amount of annual rainfall?
6 Are there any dry months?
7 Why are the temperatures so high all year round?
8 What are the climatic characteristics of Kano?
(Hint: annual range of temperature, rainfall distribution, distribution of hot and cold seasons)

Figure10. 2a

Worksheet exercises for less able pupils (Remedial loop)

1 Read page ... of the textbook.
Find the answers
The highest temperature is in March. It is:
a. $22^{o}C$ b. $28^{o}C$ c. $31^{o}C$ d. $35^{o}C$
The lowest temperature is in:
a. January b. April c. August d. November
It is _____ ^{o}C

2. Fill in the blanks
sun high average temperatures
The _____ and the amount of rainfall are _____ in summer in Kano because the _____ is overhead (Chinese translation) over the Northern Hemisphere (Chinese translation). In the hottest months, the _____ temperature is usually over $30^{o}C$.

3. The annual rainfall
Complete the following table:

Month	Rainfall (mm)
January	2
February	0
March	3
	10
	70
June	
	310
September	
December	0

Total = _____

The annual rainfall of Kano, Nigeria

Figure 10.2b

Worksheet exercises for the more able pupils
(Extension 1A)

Using the data in the table, draw a climatic graph for Darwin. Then do the following:

1 Represent the temperatures by a smooth red line.
2 Represent the rainfall by blue columns.
3 Calculate the amount of total rainfall.
4 Give the climatic graph a suitable title.
5 Compare and contrast the climatic characteristics of Darwin and Hong Kong.

(Please find the climatic graph of Hong Kong on page xx of your S1 Geography textbook.)

Figure 10.2c

Worksheet exercise for all pupils (Core I)

Referring to the transparency of the problems faced by the Masai and the African tribes (Chinese translation), answer the following questions:

1 What are the problems faced by the Masai?

Climatic problems:_____
Soil fertility:_____
Cattle:_____
Food supply:_____

2 Match the problems in column A with the solutions in column B.

Column A	**Column B**
1. Drought	A. Planting trees
2. Soil Erosion	B. Food aid
3. Diseases and pests	C. Developing irrigation
4. Famine	D. Good breeding

Ans.: 1.____ 2._____ 3._____ 4._____

3 Design a poster for helping the people suffering from famine (Chinese translation) in Africa.

Figure 10.2d

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Worksheet exercise for less able pupils (Remedial loop)

Study the textbook on page xx. Listen to the tape. Fill in the missing words.

In the savanna areas, rain usually comes in s_____ only. Sometimes no rain falls on the land in winter. It is difficult for farmers and herders (Chinese translation) to grow food or to water their livestock. D_____ is one of the problems of the savanna lands.

The Masai often keep too many cattle. However, too much grass is eaten up by cattle and the land becomes bare. Overgrazing (Chinese translation) causes s_____ e_____. Less grass grows and the grass is poor quality, too. The land becomes wasteland (Chinese translation). The cattle becomes t____ and poor. There are also p_____ which eat up crops or kill animals and people. For example, _____ (Chinese translation) brings a disease called sleeping sickness. Millions of people do not have enough food to eat for years. They suffer from m_____ (Chinese translation). These people are in poor health.

Figure 10.2e

In addition to the graded worksheet exercises, group activities involving all pupils are provided as Core II materials. In teaching the topic, Polly chooses the snake and ladder game (Stimpson 1990, p. 58) which helps pupils understand some of the problems of living in the savanna lands. Because the squares within the game sheet contain some specific terms, she provides a separate sheet with some translations or explanations of terms to help less able pupils understand the instructions. Then the pupils are asked to complete some questions (Figure 10.3 a-c).

Exercise for less able pupils (Core II, Remedial loop)

The problems in the tropical grasslands are:

a. Drought ; low r_____;
b. Malnutrition (Chinese translation); poor h_____;
c. Diseases and p_____ (Chinese translation);
d. D_____ (Chinese translation); soil erosion

[with illustrations as hints]

Figure 10.3a

Exercise for average and more able pupils (Core II, Extension IA)

Describe the problems encountered in the savanna landscape. Suggest some solutions for solving these problems.

Figure 10.3b

Worksheet exercise for more able pupils (Extension IB)

1 What are the natural and human causes of famine in the savanna lands?

2 Can you suggest some solutions to overcome the problem of famine?

(Hint: To get some ideas, read Chapter 18 'A quiet hunger' in *Living in a Global Environment*, edited by John Fien 1989)

3 Write a letter of appeal for helping the people suffering from famine in Africa

Figure 10.3c

10.5 Conclusion

This chapter has discussed the use of graded worksheets in teaching mixed ability classes. It has been stressed that all pupils in a mixed ability class should be given proper attention and pupils should be given opportunities to stretch their abilities and develop their own potential. The model of graded worksheets suggested here does not envisage solely the use of printed worksheets: rather, they may be combined with other teaching resources such as textbooks and audio-visual resources. In addition, the worksheets can incorporate common task and group activities such as designing a poster and playing a game. If properly designed and planned, worksheets can both suit pupils' differing abilities and create a co-operative atmosphere within the class.

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11 USING COOPERATIVE LEARNING WITH COMPUTERS IN GEOGRAPHY CLASSROOMS

Christine Kim-Eng Lee

11.1 Introduction

When compared to "traditional" classrooms, cooperative learning classrooms have been shown to contribute positively to student achievement, ethnic relations, self-esteem, and classroom climate, etc (Sharan 1980; Johnson et al. 1981; Slavin 1989). Such benefits of cooperative learning activities are applicable to students at all age levels, for all subject areas and for a wide range of tasks (Bossert 1989). Research and development efforts have produced a considerable knowledge base about cooperative learning methods and the conditions under which they can be successfully implemented in the classroom. It is timely for geography teachers to tap the potential of cooperative learning methods in their classrooms. A worthwhile avenue for geography teachers to explore the benefits of cooperative learning is to combine its use with computers. With current interest in information technology and multimedia, computers will soon become an important teaching tool in schools.

Most computer courseware is written for use with individualised instruction. But in reality, students often work in groups at the computer because most schools cannot provide a computer for each student. The group learning environment must be taken into account in the design of computer courseware. According to Male (1994), the real power of the computer, as well as the power of cooperative learning, is best realised through problem-centred or learner-centred software. The goal in using learner-centred software is to encourage students to take intellectual risks and to communicate with each other about the task in hand. Cooperative learning, as a form of group learning, provides opportunities for such interaction and can thus be applied to make learning in the geography classroom via computers more effective.

What is cooperative learning? Cooperative learning is a form of classroom organisation in which students work in small groups to help one another learn. It differs from competitive and individualistic learning. In competitive learning, students work against each other to see who is the "best". In individualistic learning, students work on their own without paying attention to other students. Not all forms of group learning are cooperative learning. Hooper (1992) cautions that grouping students at the computer without paying attention to the environment within which students work together may lead to few benefits. Any teacher who would like to optimize the effects of cooperative learning with the use of computers must pay attention to the essential components which make cooperative learning different from other forms of group learning.

This chapter is intended to help geography teachers interested in using cooperative learning with computer software to design lessons aimed at optimising the effects of cooperative learning. It will provide (1) a discussion of the theoretical underpinnings of cooperative learning methods; (2) a description of the essential features of cooperative learning and; (3)

examples of computer-based geography lessons which incorporate essential elements of cooperative learning.

11.2 Theoretical perspectives on cooperative learning

There are now many cooperative learning methods for geography teachers to select from. The more commonly used generic forms of cooperative learning methods are Student Team Learning such as "Student-Teams-Achievement-Division (STAD)", "Team-Games-Tournament (TGT)", and "Jigsaw II", developed by Robert Slavin and his colleagues; "Learning Together", developed by David and Roger Johnson; and "Group Investigation", developed by Shlomo and Yael Sharan and Rachel Hertz-Lazarowitz.

The expanding work on cooperative learning is not based on a single theoretical perspective but on several perspectives. For example, the Group Investigation Model has its theoretical foundations in the ideas of philosopher Dewey (1938). These ideas are that:

- learning is done in interaction with others,
- students learn by doing,
- classroom life should be democratic,
- knowledge is changing, not fixed,
- students should learn how to relate to each other and to respect the rights of others,
- learning should extend beyond the classroom.

Thus, in the Group Investigation Model, students choose their own topics and which group they will be in, they also formulate the research problem and decide how to investigate the problem using a division of labour. In searching for answers to the problem, students construct the knowledge they acquire rather than having it presented to them prepackaged by the teacher. After their investigations, the groups plan and present their projects in class. The projects are then evaluated by both teacher and students.

Slavin's Student Team Learning Methods are based largely on the ideas behind behaviouralist psychology, such as group contingencies in terms of rewards as a form of extrinsic motivation. The three central concepts in Student Team Learning Methods (Slavin 1986) are:

- Team Rewards. Teams may earn certificates or other teams rewards if they achieve a preset standard.
- Individual Accountability. The success of the team depends on the individual learning of all members.
- Equal opportunities for success. Improvement scores of individual students contribute to the team score. In this way, high, average, and low achievers are equally challenged to do their best.

For example, in a "Jigsaw II" lesson for a fifth grade class, the topic on "Water" is jigsawed into different sections, such as water as a precious resource; uses of water; sources of water; water treatment; water pollution and water conservation. Each team member is accountable for learning his or her section well enough to teach this part to the rest in the team (individual accountability). Learning is done in expert groups comprising members of different teams assigned the same section. Students take individual quizzes after making sure that every member of the team has mastered the material. Individual improvement scores contribute to

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team scores and teams earn certificates when they meet preset standards (team rewards and equal opportunities for success).

Johnson & Johnson developed their "Learning Together" model using ideas from social psychology. According to researchers (Deutsch 1949) working from this perspective, cooperative goal structures create a situation in which the only way group members can achieve personal goals is if the group is successful. The Johnson brothers have expanded the concept of goal interdependence to include other forms such as task, reward, resource and role interdependence. An example of their "Learning Together" model involves students working in four or five-member groups on assignment sheets. A group hands in a single sheet, and receives praise and rewards based on the group product.

Although there are often important differences among the theoretical perspectives behind the various cooperative learning methods, these methods are not mutually exclusive. There are areas of communality. All the cooperative learning methods share the idea that students work together to learn and are responsible for one another's learning as well as their own. They all favour the predominant use of heterogeneous groups. The following section will describe the essential features of cooperative learning methods in greater detail. These features must be considered in the design of lessons which attempt to make group learning via computers effective

11.3 Features of Cooperative Learning Methods

11.3.1 Heterogeneous Teams

Students are assigned to 2 to 6 member teams where there is a good heterogeneous mix, taking into account such factors as sex, ethnicity and academic achievement. Sometimes, though, the teacher may prefer to use random assignment. This helps to keep team assignment simple and to demonstrate to students that they are expected to work together in groups no matter where they are assigned.

11.3.2 Team Building and Teaching of Social Skills

Putting children together to work at the computer is not enough. Children need to feel a commitment and concern for others in the group (Anderson 1989). Teachers must take time for team-building and class-building in order to create a classroom context within which maximum learning can occur. Some team-building activities include selecting a team name, a team motto or drawing a team mascot.

One also cannot assume that children have the social skills to work together in a group. Social skills such as encouraging one another have to be directly taught and students must be motivated to use them.

11.3.3 Positive Interdependence

Positive interdependence means that group members feel that "they sink or swim together". In other words, no one is successful unless everyone is successful. Some examples of positive interdependence include:

- Goal Interdependence - "You are expected to present a group report at the end of your investigations".
- Task Interdependence - "Each of you will be responsible to gather information from the CD-ROMs on a different aspect of the topic".
- Role Interdependence - "Each of you will have different roles; One of you will be the technical adviser as you are competent in the use of the computer; Another will be the search strategist as you are most familiar with using CD-ROMs on computer".
- Reward Interdependence - "If all of you work well together, you can earn extra computer time".
- Resource Independence - "All of you in the group have to share the computer and the CD-ROMs for the project".

11.3.4 Individual Accountability

Individual accountability encourages each student to contribute to the group and to learn. The role of the teacher is to monitor exactly how much each student has contributed or the level of mastery by each student of academic content and/or skills. For example, in a cooperative computer lesson using CD-ROMs, each student must know the search strategies needed to retrieve information or how to produce a computer printout.

11.3.5 Group Processing

In group processing, group members discuss how well they are achieving their goals and reflect on the group process. Group processing is essential if the teacher wants students to behave as though in the classroom, "We are all in this together, sink or swim".

11.4 Research on the use of cooperative learning in computer-based environments

Numerous studies have documented the effectiveness of cooperative learning in bringing about positive cognitive and affective outcomes (such as achievement, self-esteem, liking for school, inter-ethnic relationships and use of higher-level thinking), when students are learning academic materials without the use of computers (Bossert 1989; Slavin 1990). The question that remains is whether or not the potential benefits of cooperative learning can also be seen in a computer-based learning environment.

Johnson et al. (1986) in one of the earliest research investigations of the issue found that when computer-assisted cooperative, competitive and individualistic learning were compared, cooperative computer-assisted learning promoted:

a higher quantity and quality of daily achievement,
b more accurate recognition of factual information, and
c greater ability in higher-level reasoning and problem solving.

In the cooperative computer-assisted situation, pupils used a computer simulation named "Geography Search" and worked in groups of four to complete the simulation task. Group members were assigned different roles (captain, navigator, meteorologist and quartermaster) and received daily feedback on how well they were performing. The students were also informed that their grade would be based on the average of the scores of their group members based on the final test and daily worksheets. Mevarech et al. (1991) investigated the same issue but in a mathematics classroom. They also found that students in the cooperative CAI situation performed better than students who used the same CAI programme individually. Furthermore, students in the cooperative CAI situation became less anxious about maths, especially the low ability students. It is clear that there is available research evidence of the effectiveness of cooperative learning in the computer-based learning environment, compared to individualistic and competitive learning structures.

11.5 Student Materials

This section provides examples of how cooperative learning can be combined with the use of computers in geography.

11.5.1 A Cooperative Group Inquiry using CD-ROMs

This example is a cooperative group inquiry using computerised data bases or CD-ROMs to investigate the topic, "Oil industry in India". More and more information is now stored in CD-ROMs. CD-ROMs incorporate text, visuals, graphics, animations and video clips.

11.5.1.1 Objectives

A Students will be able to use CD-ROMs as reference tools and develop effective search strategies
B Students will be able to work as a group to produce a joint report on "Oil Industry in India"

11.5.1.2 Resource Materials

CD-ROM software such as Microsoft ENCARTA, The New Grolier Multimedia Encyclopedia, Compton's Interactive Encyclopedia, Infopedia, Webster's Interactive Encyclopedia

11.5.1.3 Procedures

A Preparation for Group Inquiry

1 Team Formation: Students are assigned to five member teams, heterogeneous in terms of gender, ethnicity, past academic achievement and computer competence.
2 Allocation of Roles: Each student is assigned one of the following roles - technical adviser (who makes sure that everyone knows how to use the computer and the CD-ROMs), search strategist (who enters the group decision regarding the strategy used to retrieve information), recorder (who supervises a division of labour so that all group members help in recording the information collected), encourager (who encourages all students to participate), report organiser (who supervises a division of labour so that all group members help in putting together the final report).
3 Social Skill: "Encouraging one another".

B Lesson

1 Students are briefed on what is the goal of their group inquiry.
   a The goal for each team is to produce a joint report on the "Oil industry in India" (goal interdependence).
   b Each member of the team is assigned one of the following aspects of the topic: the location of oil reserves in the world; the distribution of oil reserves in India; the methods and techniques used to locate, extract and refine oil; the factors influencing the growth of the oil industry in India; the problems faced by India in the industrialisation process and solutions adopted (Task Interdependence).
2 Students are taught how to retrieve and access information from CD-ROMs
   Each student in the team must learn how to manipulate the CD-ROM with the help of the technical adviser, as well as to search and retrieve information for the section he or she is responsible for with the help of the search strategist. All must also know how to print out both text and visual information from the CD-ROM (individual accountability).
3 Students meet in their own teams to carry out their own search using the CD-ROMs.
4 Students discuss the information they have gathered on individual aspects of the topic and how they will put them together for the joint report.
5 Students present their joint report in class. Each student participates in the presentation. Each team will also produce a report of the process they adopted in searching and retrieving information from the CD-ROMs and the search strategy used.

C Mode of Evaluation:

1 Product Evaluation: The joint report and an individual test on the "oil industry in India". Team scores will consist of the score from the joint report and individual improvement scores from the test (individual accountability).

2 Process Evaluation: The report on search strategy used by the team and a mind map showing positive and negative experiences working as a group (group processing). The groups will also evaluate how well they did on the social skills of "encouraging one another".

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12 COMPUTER SIMULATION AND ENVIRONMENTAL LEARNING: AN APPROACH TO GEOLAB

Volker Albrecht

12.1 Theory: between epistemology and reduction of complexity

GeoLab is a simulation programme that represents the causes and effects of natural threats in the Alps. The main goal of the application is to enable reflection about the method of knowledge acquisition with reference to geo-ecological processes and to their representation in models and computer simulations. Crucial to the application of computer simulations in general, and to GeoLab specifically are the following questions:

- what kind of facts, assumptions and speculations on geo-ecological processes is it worthwhile to know?
- what function has the computer in structuring and representing environmental knowledge that has been accepted to be worthwhile to know?
- or more generally: what kind of reality (and with it, what kind of attitudes toward reality) are to be built up by computer simulations?

These questions (and the application of GeoLab) have been put into the following theoretical framework (Albrecht et al. 1990):

- the processes of knowledge acquisition are associated with the question of how to achieve knowledge,
- knowledge of the reality represented in GeoLab is an outcome of actions and approaches towards natural phenomena in the Alps (in respect of scientific research as well as of land-use decisions and political judgements),
- a simulation programme has to develop an awareness that the knowledge of so-called "true facts", and the insight of processes of a given part of reality to which these facts relate, depends upon the intentions and actions with which a given reality is approached (Dewey 1975: knowledge of experience).

Behind these very general statements of considerations on perception, the awareness of the environment and the function of computer simulations for environmental learning, lie a broad set of epistemological questions. They touch upon the philosophy of nature and theories of knowledge, as well as upon theories of learning. It seems to be very obvious that under these broad ramifications a consistent theory cannot be constructed, if one understands that theory means a systematically related set of statements, including some law-like generalizations, which is empirically testable (Macmillan 1989, p. 92).

I should also mention that for planning and application of GIS similar questions should be applied: what are the underlying ecological concepts, the models of nature, and specifically the ideas of the relationship between man and nature which might help to organize the in-

creasing flood of data of any kind?

Simulations are generally described as processes of designing models of a real system and conducting experiments with the models for the purposes of describing, explaining and predicting the operation of the system.

For the purpose of teaching, the use of simulations should enhance a student's skills primarily in graphicacy, numeracy, logical thinking and problem solving. There is no doubt that for the designing and application of simulation programmes, the elements described above form an unquestionable basis.

But education certainly has a broader perspective, because it deals with the transfer of the meaning and value of human knowledge and behaviour. This generalized statement has to be related to the socially and spatially more and more differentiated but globally interconnected world. Individualization and continuous differentiation are dominant aspects of a student's life. On the other hand there is an increasing need for simple and holistic explanations of the complex world. Moreover, do young students look for continuity and security in a permanently changing world (Erikson 1974, p. 246).

Any computer simulation and its underlying models tend to reduce the complex world. Reduction and simplification in different forms are necessities for epistemology and learning. But it is also necessary to reflect on the process of reduction and its intended or unintended causes and effects. Therefore every model and every computer simulation should be seen via the perspective of validity and plausibility.

One has to bear in mind that most of the knowledge transferred in school or through the media represents only a part of a given reality. Therefore, one intention of education is to focus upon the destruction of given, longstanding concepts of modelling the environment or man-environment concepts. The process of conceptualizing and model building itself has to be analysed and to be evaluated. Or in other words, one has to undertake reflections on the process and the effects of reductions of complexity. No statement should remain unquestioned. This educational goal has also to be applied to the use of computer simulation for environmental education.

The question of reduction, simplification and representation of the outside world has a longstanding history in educational and psychological as well as in geographical thinking.

When Bruner (1971, p. 10) asked, " what is meant by representation? What does it mean to translate experience into a model of the world?", he put forward the kind of questions which should be considered by any reflection on education, but which should be especially kept in mind if one is talking about computer simulations and environmental education. One can follow Bruner's concepts of learning to get to the crucial questions, if one deals with the status of computer simulations in education. He distinguishes three different forms and processes of the assimilation and adaptation of the world: the enactive form, the iconic, and the symbolic (Bruner 1971, p. 10-21). Enactive learning happens through acting in the world and dealing with it; iconic representation deals with a visual organization and representation of the world, which is enabled by summarizing images; and the third form of representation is called the symbolic. The world is represented by terms and language. It is and it is at this stage that a difference can be made between appearance and reality.

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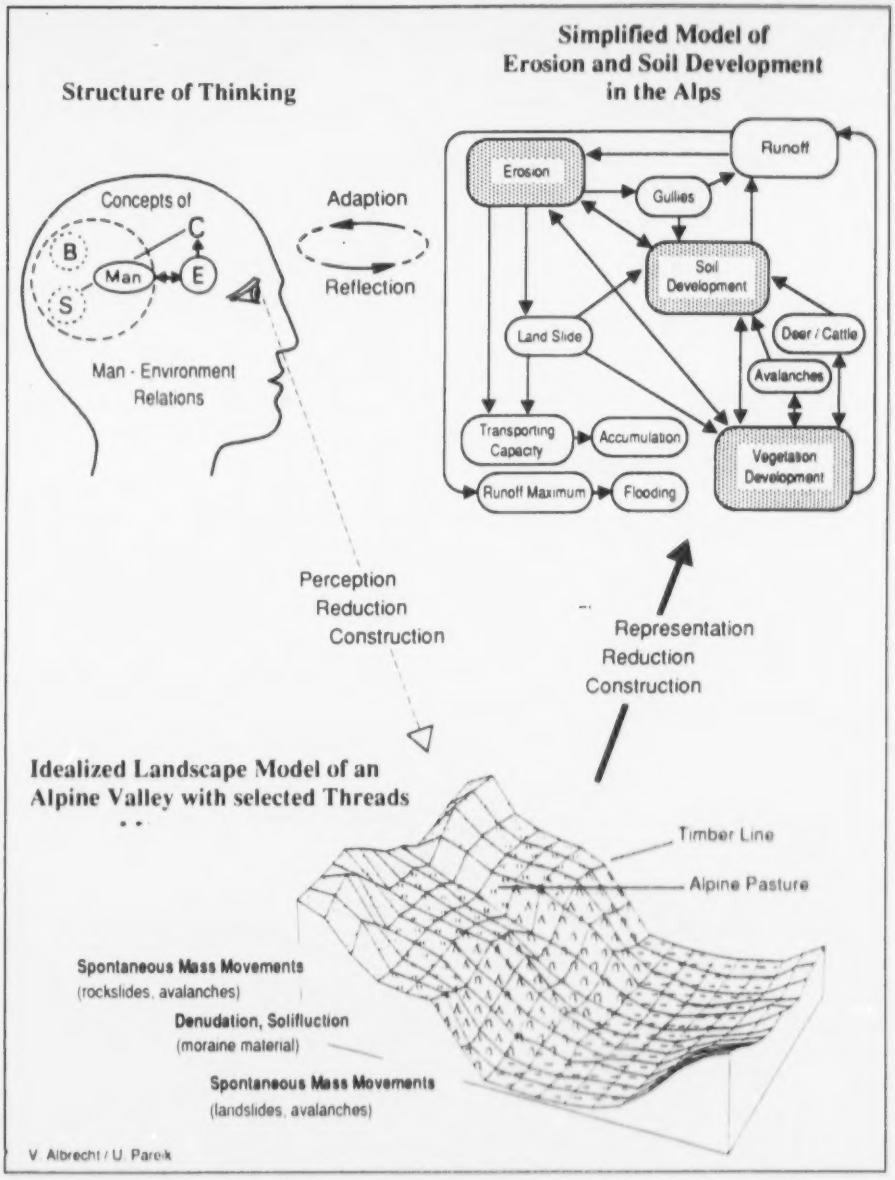

Figure 12.1 *Some determinants of environmental learning*

Figure 12.1 expresses some relationships between the structure of thinking and different kinds of representations of the environment. The key words to be considered are construction, reduction, reflection, structure of thinking, model, and concepts.
The issue is what kind of learning processes construct what kind of concepts of man-environment relations? These relations are made up of general societal conditions (S) and the definition of man-environment relations (Man-E) that might have an influence on the individual's behaviour. The question is how concepts of man-environment relations are built up, and how they may be influenced and changed by the application of computer models. This question refers to the construction (method of representation) as well as to the application (teaching method) of GeoLab.

12.2 Method of representation

Two types of models represent in GeoLab the causes and effects of threats in the Alps. The first is an idealized landscape model of an Alpine Valley which represents in an iconic way the landforms, the vegetation distribution, and the threats related to relief and height. The art of iconographic representation permits a direct transfer to reality. The presentation is idealized, includes observable geofactors, and the image can be related to any Alpine valley. The different forms of threats are related to the areas where they mainly occur. In the words of Bruner, this landscape model deals with the visual organization and representation of the world. On the computer screen, this iconic representation can be seen as a three-dimensional model that represents an area of 4 to 5 km^2 (Figure 12.2). These landscape models are either mathematically constructed three dimensional models or more or less realistic representations of mountain areas in Europe (e.g. Watzmann, Matterhorn). Some thematic levels are spatially underlain by each grid field (altitude, height-zone, inclination, aspect, geology, soil-type, vegetation), some are partially available attributes (deer/cattle, land-use, surface run-off, threats) or linear objectives (gullies, natural brooks, cascaded brooks, canalized brooks, roads, fences).

I am not quite sure how far the simplified model of Erosion and Soil Development in the Alps in Figure 12.1 fits precisely into Bruner's third category of symbolic representation. It is made up of a relational set of terms and language. Whereas the idealized landscape model offers appearance, the structural model of Erosion and Soil Development refers to a systemic process. Though the erosion model seems to be more complex than the idealized landscape model, they both represent different forms of complexity: the landscape model gives a kind of holistic appearance of a complex and unknown totality, whereas the erosion model covers a small part of a complex reality which one thinks is working behind the appearance of the landscape model. Whether this model is describing the "real" processes is not relevant. What is relevant is think about the plausibility of the model structure in explaining the phenomena of the outer world. The structural model can not be seen - it has to be discovered, constructed, and empirically tested. This model, which is partly governing the computer calculations, should be reconstructed by the student. The student is confronted with a set of structural and hidden representations of a visual representation of an alpine valley. He is put

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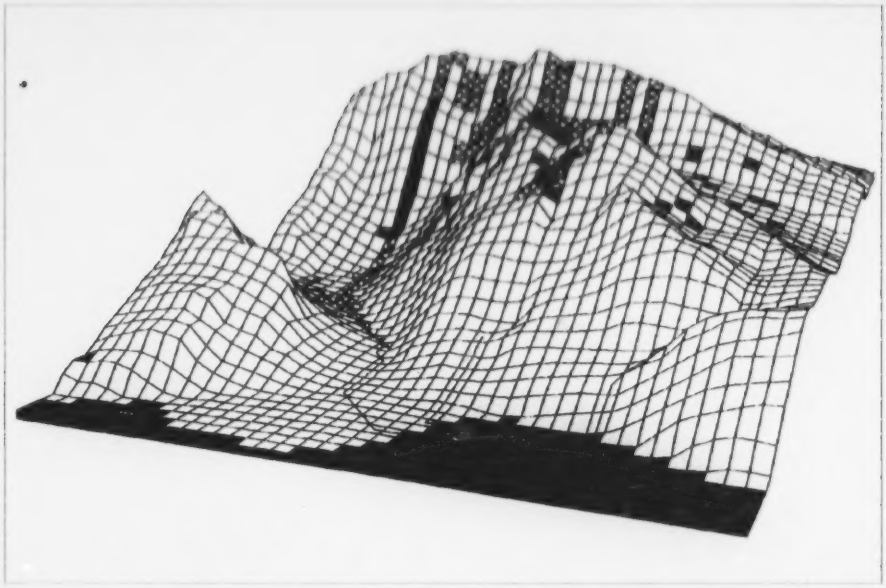

Figure 12.2 Grid - Watzmann model with the distribution of selected threats

into the position of a researcher who wants to find out how visually observed phenomena are to be explained.

GeoLab is a programme that describes the interdependencies of geofactors in mountain areas of the marine and humid continental climatic regions in Europe (mostly within the range Köppen's Cfb and Cfa classification). The goal of the simulation programme is to show the effects of land-use decisions on selected ecological factors and their related spatial processes. The simulation programme is based upon different kind of structural models with different levels of generalizations. A very descriptive model describes the overall pattern, factors, causes and effects which have to be taken into account and which can be studied. The main algorithms / models are built around the teleological concept of climax vegetation with different stages of ecological successions, its degeneration and man's impact upon it (Figure 12.3). Closely related to the development of vegetation is the development of soils. Vegetation and soils and their constituent components indicate ecological processes and the possible effects of man's impact.

The information structure contains, for each grid field, data sets with different levels of generalizations for the underlying geofactors. To operationalize the different factors and transfer them into a formalistic artificial language that follows "if- then-clauses" is a complicated task, especially if one wants to be "geographic" and educational. The first wants to keep up with the "chorological paradigm" (in the American-English context one would prefer the term "spatial paradigm"), whereas the educational goal aims at the reflective and the epistemological.

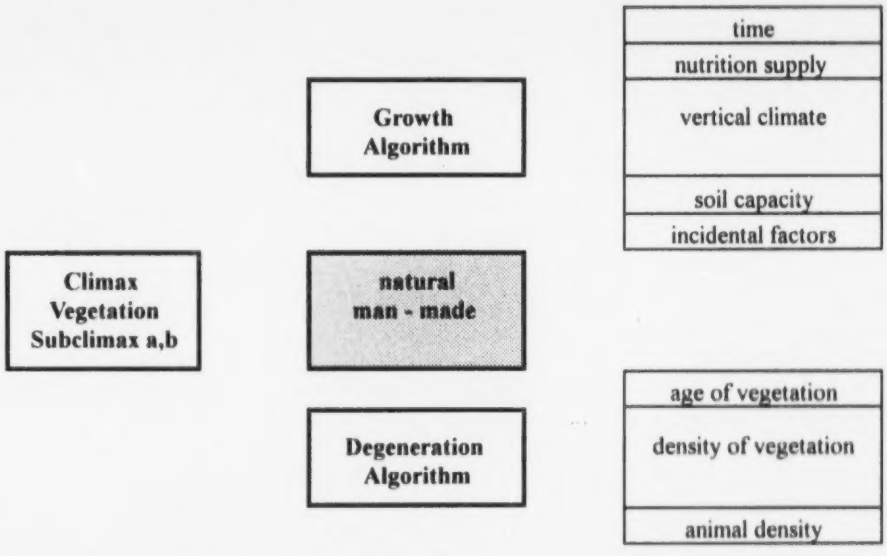

Figure 12.3 Module structure of vegetation development

The idea of reflecting upon how one is structuring knowledge about reality (or the represented reality in the computer), and what kind of impact the pathway of knowledge acquisition has on the outcoming structure of knowledge, has some consequences for the development of simulation programmes. The user should be able to hypothesize about possible relationships and be able to prove or disprove the hypotheses using certain instruments of analysis.
Hypotheses are formulated on a general level, whereas the proof of their validity is achieved by empirical observations of single phenomena. The user surface should enable one to relate generalized statements and the research of precise data. The data set at the level of attributes allows a geoecological analysis for each grid field.

12.3 Method of teaching - student material

The term 'enactive' is today a much used and misused word in the shiny world of computer technology and its brilliant bride of multimedia. Enactivity in the sense of Bruner means acting and dealing with the world, thus shaping the world in one's mind. A computer simulation therefore should have the components of structuring and changing the elements of the underlying concepts. Ideally there should be possibilities to experiment with different scenarios in order to explore the modelled domain. Thus one strength of computer simulations is

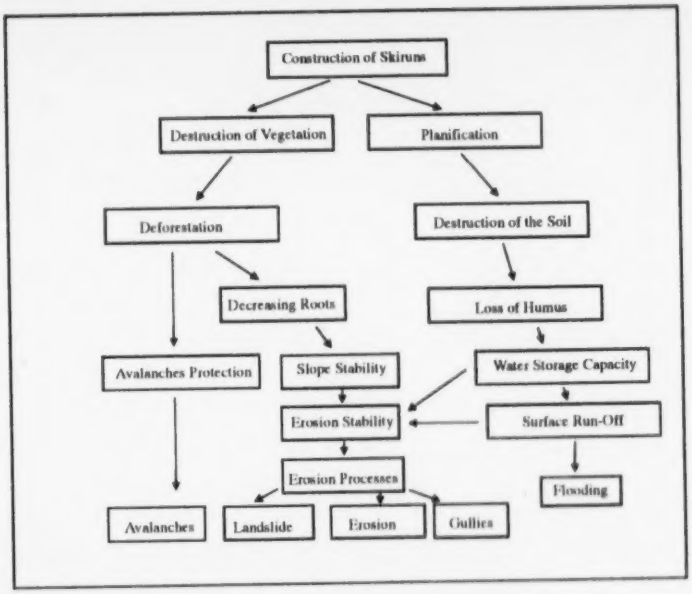

Figure 12.4a *Student material 1a*

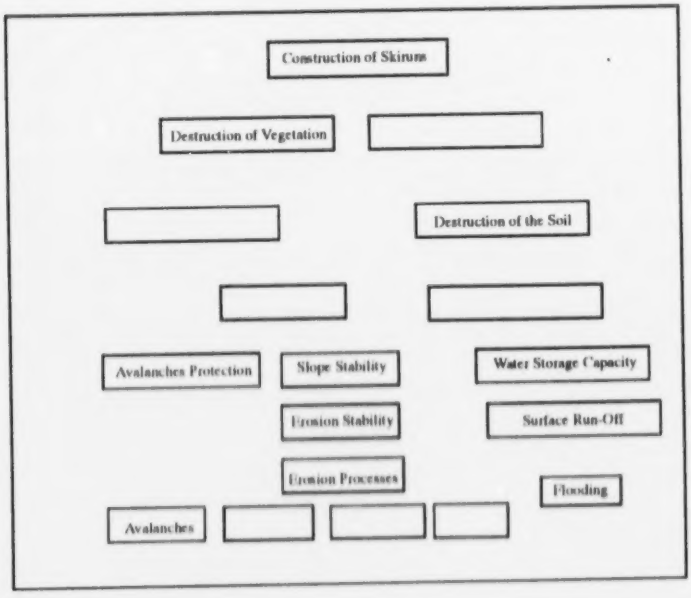

Figure 12.4b *Student material 1b*

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discovery learning. But learning does not only mean that the user gets a knowledge of facts (declarative knowledge) but he should also have the opportunity for epistemological insight. Bruner argues that the internalization of symbolic techniques enables some kind of rational behaviour. To him all three aspects of representation are part of human behaviour, though their relationship is obviously dependent upon age.

Ideally each teaching process should integrate some elements of the three forms of world representations. This statement is also true for the application of computer simulations.

Considering the statements on social realities and general ideas of education three methodological goals seem to be important:

- action-orientated environmental learning (process-orientated knowledge, self determination, and cooperation),
- geoecological thinking (thinking in networks, systemic thinking),
- ecological thinking from a spatial (geographical) perspective (chorological dimension).

From an educational point of view the reductive aspects of models are very productive (in respect of acquiring knowledge), because the perceived differences with the image of the reality outside the computer programme can stimulate questions about the applications and the limitations of the model which runs the simulation programme.

To teach, or better to make understandable how a model works, the model structure and the user surface of the simulation programme should;

- be open (to allow different approaches to solutions of a given problem),
- give opportunities of learning by doing,
- develop strategic thinking, and
- focus on the process of decision making.

It should also be mentioned, though I think it might be too obvious, that any judgement of the results of simulation-runs lies outside the parameters and formulas which constitute the components of the underlying model. This evaluation has to be done by the user himself.

By four didactical and methodological approaches the above mentioned theoretical implications are verified or otherwise:

- By experimentation with the menu title "Edit Geofactor", to develop hypotheses on the relationships between different geofactors,
- By simulations with the menu title "simulation set" and "simulation run", to modify the functional model of GeoLab and to compare the intensity and regional distribution of threats with and without modification of the functional model,
- By land-use decisions and to realize them with the menu title "land-use", and to develop hypotheses about the possible influences of geofactors and land-use decisions on the intensity and regional distribution of threats.
- By analysing and checking the simulation results through geoecological raster analysis and to verify the hypotheses or not.
- Main methodological terms: construction of reality, thinking in ecological dimensions.

Theory and method are strongly interrelated and this is also true for the relationship between methods and student material. I want to exemplify the theoretical intentions on behalf of the topic "threats caused by ski-runs". The materials presented in Figure 12.4 and 12.5 can be

used in an open and flexible way. One can leave out the arrows and certain processes that have to be found and justified by simulation-runs (as shown in Figure 12.4a and 12.4b). In an extensive evaluation of the programme (Möller 1994), it seemed to be useful to leave out "planification", "deforestation", "decreasing roots", and "soil coverage".
By analyzing the different parameters that might have an influence on the effects of skiruns on the intensity of threats, the structural model shown as the simplified model of Erosion and Soil Development in the Alps may be reconstructed by working on Submodel Erosion (Figure 12.5). The simulations run should be undertaken without and with the human impact. Thus some hypotheses may be developed on the effects of man-environment relations.

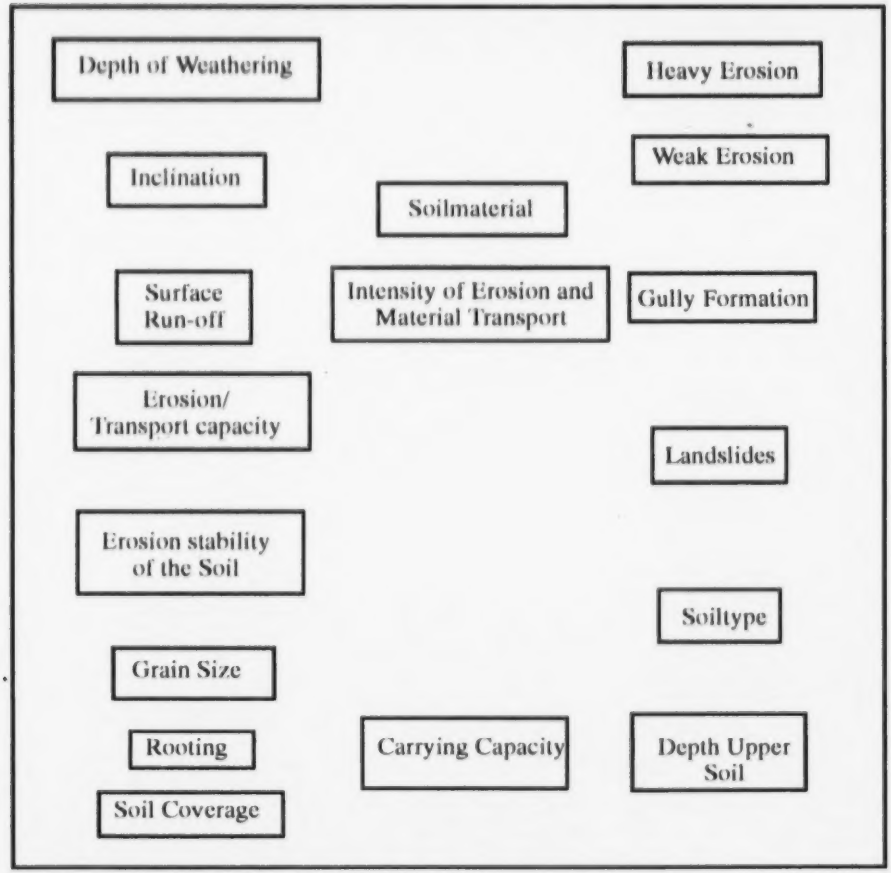

Figure 12.5 Student material 2

12.4 Summary

GeoLab enables the student to reflect upon the method of knowledge acquisition in reference to geoecological processes and their representation in models by experimenting with the menu title "Edit Geofactor". Spatially differentiated editing with the geofactors geology, soils and vegetation opens up an opportunity to develop one or several hypotheses on the relation between the underlying geofactors.

Simulation: the student can modify the functional model to determine the precipitation pattern for example; he can compare the effects of different precipitation patterns on the regional distribution of threats with and without modification of the functional model; he can develop hypotheses in respect to the relation of precipitation intensity and regional distribution of threats (a partial aspect of morphodynamical processes in the Alps).

Land-use decisions: there is the possibility to realize land-use decisions with the menu title "land-use"; one can implement ski-runs; rum simulation with process-steering; again to develop hypotheses about the possible influences of geofactors and land-use decisions on the intensity and regional distribution of threats;

Analyse and check the different hypotheses with the menu title 'information'; the method is comparable to geoecological field analysis.

Model-building: The last and perhaps the most important part is the model-building process, by which the model behind the simulation has to be reconstructed (as in Figure 12.5).

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Acknowledgement

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SECTION C

ENVIRONMENTAL LEARNING

ENVIRONMENTAL LEARNING: INTRODUCTION

Gerard Schoenmaker

Environmental learning can be characterized by its method. It is by definition investigative and pupil centred (see chapter 13 written by Walford). Students tackle a problem as independently as possible (see chapter 17 written by Cooper & Coggins). In doing so, they develop different kinds of skills, like map reading, questionnaire techniques, working with statistical data and gathering and selecting information. A well planned field trip, guided by trained teachers plays a crucial role in all this (see chapter 14 written by Kent).

A second characteristic of environmental learning is formed by the fact that its focus is a problem of society. This is shown by Cooper & Coggins in chapter 17 and by Veldman in chapter 16. This focus can be localized in the direct surroundings or far(ther) away, but it will always involve the interaction man-environment. Within this process of interaction conflicts of interest may arise and political and economical decisions will be taken which are not in accordance to all participants' wishes and expectations (Cooper & Coggins, Veldman). Through investigative learning, sometimes involving role play (Cooper & Coggins) students gain insight in the genesis of decisions defining the development of the (own) environment (Veldman).

The third characteristic is closely related to the previous one and provides the conditions needed to promote the self guided methods and the success of environmental learning. We are dealing here with internalizing the subject matter, the personal involvement of the student with the problem at hand (see chapter 15 written by Van Dijk & Stomp). The problem is also theirs and they themselves have to gather knowledge and insight to define their own attitudes and actions. Personal involvement confronts the students with a human-environment relationship governed by the human power to transform the world (Veldman, Van Dijk & Stomp). It also confronts them with the social and physical constraints of environmental decisions and behaviour (Cooper & Coggins).

Environmental learning makes students think and work from a geographical perspective. This could be called the fourth characteristic. Students learn to search for interrelations at a local, a regional as well as at a global level. They learn to integrate the studied phenomena within a larger whole and also to combine them with knowledge from other school subjects (Van Dijk & Stomp).

13 PROMOTING GEOGRAPHY AS A SCHOOL SUBJECT THROUGH PUPIL-CENTRED ACTIVITY AND RESEARCH

Rex Walford

13.1 Introduction

'The field, for us, is the primary source of inspiration and ideas, and it inspires a great part of both the matter and the method of our subject' wrote S.W. Wooldridge, Professor of Geography at Kings College London, in 1948, encapsulating the enthusiasm and essence of a tradition in geographical study which spreads beyond the British origins of this quotation.

13.2 Theory

The genesis of pupil-centred activity and research may, perhaps, be traced back to Rousseau's philosophical essay EMILE (1762) in which it was shown that man could profit from the lessons of nature and that to learn by experience from nature was nature's way, leading to a freedom of thought and spirit. If the body was strengthened and the senses trained, sight, hearing, touch, smell and observation would lead to questions about cause and effect. Only when children had been taught to learn in this way would they benefit from books.

Following this Pestalozzi developed the Nature School of Education, stressing the primacy of empirical investigation in the natural environment, a theme also taken up in the following century by Froebel, whose writings were to have immense influence on generations of teachers and teacher-trainers who dealt with young children.

In the twentieth-century the American John Dewey has been another writer who has influenced the nature of much thinking about the education of children, with his stress on the 'child-centredness' of teaching approaches and the potential and advantages of having children working in groups.

These writers have contributed to a powerful tradition, now global in scope, which has supported the proposition and development of pupil-centred activity for schools in a variety of environmental situations. In some cases, this is advocated as relatively informal and fundamentally existential, with the 'outdoor experience' itself being deemed to be the prime educative tool; in other cases, the vigorous pursuit of outdoor activities, such as walking, climbing, and sailing, has taken prominence as an objective. But there is a third strand of work outside the classroom which has at least as much claim to be counted educationally influential - the task-oriented work which is linked to academic classroom subjects and, sometimes, to more general public interests and concerns.

In the United Kingdom, this work has traditionally been centred in the school subject of geography. Geography was a relatively low-status subject in the first part of the 19th century,

with 'travellers' tales' and the rote-learning of locational information and cosmography often apparent, but the influential Report of Scott Keltie to the Royal Geographical Society in 1886 and the introduction of its study to the Universities of Oxford and Cambridge shortly afterwards began a major change. Over the next forty years a series of campaigns brought it acceptance as a subject fit for all students to study, and the inclusion of the study of physical and human landscapes in the field in its curriculum was an important factor in persuading many of its intellectual worth and educational relevance.

As far back as 1877 in Britain, Huxley had advocated that geographical exploration should be scientific in nature and that the best methods of education were to link explanation to a student's own experience. The best method was 'trained and organised commonsense; to begin with observational science, facts collected; to proceed to classificatory science, facts arranged; and to end with inductive science, facts reasoned upon and laws deduced' (Huxley 1877). His views were influential on educational activities in the 19th-Century RGS.

After the founding of the Geographical Association in 1893, a concern for school fieldwork was apparent, and the GA's first President, Douglas Freshfield, promoted the idea vigorously. The first edition of the Association's magazine THE GEOGRAPHICAL TEACHER in 1901 had no fewer than four articles about taking pupils into the field and the concern for the local environment was as apparent as that for more spectacular, exotic and far-flung journeys. Turn-of-the-century photographs of members of the GA on field-work excursions show them ascending Shap Fell on motor-cycles, and crossing the Grampian Mountains on three- wheelers, as well as venturing into other continents in more traditional expeditionary ways (Brunsden 1987).

13.3 Methods

13.3.1 Early land use surveys of Britain

The traditional of 'regional survey' espoused by the French school of geography and pre-eminently seen in the work of Vidal de la Blache, was one of the ways in which the emerging discipline of geography sought to organise itself in the early years of the twentieth century. In Britain, the writing of Patrick Geddes was influential and a society founded to further the ideas of Le Play (who had adduced the principles of Folk - Work - Place as a model of environmental study) became active in developing an interest in both human as well as physical environments.

But it was already becoming apparent that such encyclopaedic 'regional surveys' were daunting tasks (and capable of being done with superficiality as much as with insight and depth) when, in 1928, a young lecturer at the London School of Economics, Dudley Stamp, learnt of an innovative approach to environmental study being carried out by schoolchildren in the English county of Northamptonshire. Under the guidance of the county's Director of Education, Mr. Holland, schoolchildren were sent out to gather a comprehensive record of land-use in the county, using a simple three-category definition. Their results were collated and three maps of the county subsequently published from the data which they had provided (Field 1930).

Stamp saw the potential of this as both a geographical and educational exercise. Working initally through GA committees, within a few years he had acquired funds to set up an independent Land Utilisation Survey organisation with the avowed task of surveying the uses (and misuses) of the land of Britain, a task hitherto unattempted. Stamp believed that such a survey would reveal the need to plan an orderly landscape for the preservation of both town and country (Stamp 1931a, b). The work led to the publication of Land Use Memoirs for every county of Britain (Stamp 1948), to a Government inquiry (the Scott Committee of 1942) and ultimately to the Town and Country Planning Acts of 1947.

But Stamp was also an advocate of the educational possibilities created. The survey work was done by thousands of school-children, (usually under the guidance of enthusiastic geography teachers), who proved themselves remarkably accurate in the recording of a seven-fold classification. Stamp himself checked the correspondence of mapping at the boundaries of different survey areas and told the Royal Geographical Society in 1931 that he was delighted with the work of the young surveyors. Teachers appreciated the opportunity for the children to demonstrate their observational, mapping and presentational skills as well as the practical value and enjoyment of work outside the classroom. Over 10,000 schools (primary as well as secondary) and 250,000 school-children were involved.

The survey dovetailed well with a general increase in interest and appreciation of the landscape in the inter-war period in Britain. Geography, as an emerging discipline in the universities, capitalised on this, and university academics, such as Stamp and Wooldridge were often to be found lecturing to adult education classes or leading weekend field-excursions for generalist audiences, interpreting the landscape and inculcating 'an eye for country'.

In the 1960s a Second Land Utilisation Survey of Britain was instituted by one of Stamp's former students, Dr Alice Coleman. Again the Survey was dependent on volunteer help, and thousands of school pupils and their teachers offered their services. This time, the aim was to see what effect 20 years of planning had had on the landscape, and the classification used was considerably more detailed, but the educational objectives were similar to the First LUS and the general response and interest from schools equally enthusiastic (Coleman 1961).

By this time, the tradition of fieldwork was well-established in British schools, and many students took part not only in expeditions in their local environment, but also in week-long visits to contrasting localities in other parts of the British Isles or further afield. The Field Studies Council had been founded in 1945, and their network of field study centres was supplemented by other buildings bought and converted by local education authorities or by individual schools.

The tradition of doing fieldwork survived through the 'spatial analytic' revolution of the 1960s and 1970s with field investigation going on undiminished, although now dominated not so much by the basic gathering of information as by hypothesis testing and model-building. But the field remained the prime laboratory for these experiments, and in some ways the quality and depth of work done was improved by the application of nomothetic principles to it.

When, for the first time, the idea of a National Curriculum was conceived for British schools, in the mid-1980s, geography was given a secure place as one of the foundation subjects, and fieldwork accepted as an integral part of it. The Government stopped short of guaranteeing every pupil the chance of a residential fieldwork experience because of the enormous resource

implications, but was more than ready to write in to the geography curriculum a commitment that every pupil should carry out first-hand study in the field, and that it should be based on investigative work ('enquiry - learning').

13.3.2 The Third Land Use Survey

Thus, the idea of a Third Land Use Survey for 1996 had some secure foundations and traditions. The Geographical Association had a mixture of motives for proposing such a scheme, since for them it involved strategic as well as geographical and educational objectives. Late reforms of the National Curriculum (introduced by a committee headed by Sir Ron Dearing) had reduced the statutory element of the curriculum and geography, though still mandatory for study from the ages of 5 to 14, was now to be only an option for study in the years beyond that.

A survey undertaken by schools, in the tradition of the Stamp and Coleman surveys of the 1930s and 1960s, would help to give geographical fieldwork (and geography itself) focus and publicity. The subject was in a relatively strong position (the 6th most popular at GCSE (an examination for 16 year-olds) and the 7th most popular at A-level (an examination for 18 year-olds)) and could therefore rely on an experienced team of teachers in schools who could prepare and lead the young survey teams.

The geographical context had altered to some degree since the Stamp and Coleman surveys, since the emphasis on national planning and agricultural productivity leading to possible self-sufficiency had been supplanted by more wide-ranging concerns. Many British farmers now 'setaside' some of their farming land under the influence of grants associated with the controversial Common Agricultural Policy of the European Community. The policy seeks to reduce the 'grain mountains' of the EC, though the paradox of starving millions beyond the Community boundaries makes it a paradoxical and unjustifiable policy for some. EC grants now also affect the re-development of urban land.

But more significantly, the concern about land-use and the picture of townscape and landscape was overlain by global concerns which reflected an increased awareness of the need to steward the environment with care. The 'Local Agenda 21' proposals emanating from the UN Rio de Janeiro Environmental Conference of 1992 suggested that communities should come to know more about and understand their own environments, and the plan for the survey fitted in well with this concern. The perceptions of the young surveyors were certainly sharpened by concern about global environmental issues raised through the media. 'Think global, act local' was a suitable injunction in this respect.

The educational intentions were, perhaps, at first sight, the most constant of the objectives in the three surveys. The desire to involve pupils in all the skills of academic fieldwork, and to ally this to a task of relevance and interest was as important to the organisers of the 1996 survey as to their predecessors. These objectives have been found in geographical work, from the 1930s onwards, a continuing strand of investigative activity based on participatory methods and a far cry from the didacticism of the field lecture.

But whereas the Stamp survey had appealed unashamedly to a concept of 'education for citizenship' in national terms, the simple notion of such citizenship (and of pride and interest

in and 'ownership' of a national landscape) was now problematic for some in a more multi-cultural society and in schools where there was disaffection with the existing order of things. The organisers of the Third Survey have taken the view that this increases the need for school students to be led towards interest in their surrounding community and in the national landscape, rather than that the difficulties should be a cause for not trying.

13.3.3 How the Third Land use Survey was organised

The Geographical Association originally came to the idea of the survey through the search for a focus of a proposed Geography Action Week for November 1996. It was felt that geographers in schools should seek to demonstrate the strength and vitality of the subject in some practical way (and in this the strategy differed from the Geography Awareness Weeks which had been organised in the USA since 1987, and which were predicated on drawing the public attention to the present poor level of geographical knowledge among American students). A Land Use Survey was seen to be an ideal way of demonstrating the virtues of fieldwork, and pupil-centred activity as well as tackling a task of practical importance. The support of the Government-funded Institute of Terrestrial Ecology was sought, since scientists there had already compiled a recent data-base of rural land-uses, mainly through the interpretation of satellite photography, though supplemented by some field surveying.

The ITE readily offered co-operation and advice and collaborated with academic geographers in preparing a unique stratified sample of 1 sq km grid squares which covered a carefully selected variety of both rural and urban landscapes across the United Kingdom. (This strategy was preferred to that of the previous two surveys which had literally sought to map every acre/hectare of land. Little accuracy would be lost in the computing of national results by using an extensive sample of squares). In the summer of 1995 a provisional survey plan was drawn up and a dozen schools tried it out in a pilot exercise. The results of their work, and their views about the instructions were fed back to a sub-committee of the main volunteer organising team, which worked through the autumn of 1995 to prepare a final version of the Survey Folder.

Other committees, drawn from a spread of interested GA members considered matters of organisation, recruitment, finance and media publicity. The support of the Scottish Association of Geography Teachers, the Association of Geography Teachers in Wales, and a GA Co-ordinator in Northern Ireland was secured and some of the organisation accordingly devolved to constituent parts of the UK.

An extensive and professionally-conducted search for a major sponsor to fund most of the costs of the survey proved time-consuming, but ultimately fruitless. So in September 1995, the organising committee decided that a Registration Fee must be charged to schools who wanted to take part, in order to cover the costs of the material which they would receive. The Fee would be a vital component in balancing the finances of the project.

The Ordnance Survey, Britain's official mapping body, became helpful collaborators with the GA and offered considerable assistance in kind by agreeing to supply each participating school with a free copy of a 1:10,000 map (which would have cost £34 to purchase) which covered the 'key' grid square that the school were asked to survey. Another subsidiary deal

bought in coloured pencils in bulk so that the survey mappers would all be working with the same tools.

A preliminary to the recruiting for the survey was an article published in GA NEWS, the newsletter received by all 11,000 GA members in the autumn of 1995. This painted a journalistic picture of how a (mythical) school might hear about the survey, and take part in it and it was designed to be a light-hearted vision of future events. The main recruiting drive for surveyors was launched early in 1996 with the co-ordinated publication of articles in the GA's three major journals, GEOGRAPHY, TEACHING GEOGRAPHY (for secondary school teachers) and PRIMARY GEOGRAPHER (for primary school teachers) along with more supporting material in GA NEWS. The journals carried explanatory text (Morrish and Walford 1996 a,b; Morron 1996) as well as a Recruiting Form which could be sent back by schools which were interested.

Those schools which subsequently registered to take part in the project were allocated one of the 1000 'Key Squares' from the sample, as close to their home locality as possible. They were sent the Survey Instructions, coloured pencils, badges for the young surveyors to wear for authorisation in the field, and such important ancilliary material as Health and Safety advice, a sample letter to explain to parents what was happening, and a sample pro-forma to seek permission to survey from the owners of private land.

At the same time, some supplementary initiatives were put into motion. Local Branches of the GA (there are 60 in England, Wales and Northern Ireland) were encouraged to consider developing local or regional publications on their own account, and to survey supplementary squares to the main sample. Schools were asked if they wanted to 'twin'with another in a contrasting locality and to share information and results. A special group of volunteers took on the task of surveying the whole area of a map published by the Second Land Utilisation Survey of the 1960s, so that a comprehensive picture of change could be established in one area. A contigency plan was set up in case not all the 1000 squares were taken up by schools. Volunteers were sought through both GA and RGS publications for a 'Task Force' which would take on the survey of any inaccessible or isolated Key Squares which might not be taken up.

A training programme was organised for April and May 1996, so that, besides having the Survey Instruction Pack, teachers in all parts of the UK could have the opportunity to attend a meeting in their region or county to ask questions about the exercise and to have clarification of any points on which they were not clear.

The programme was designed to engender as much rigour and comparability as possible in the survey, although the organising committee emphasised that it was quite unprescriptive as to how the work was actually to be done. In primary schools, the likelihood was that teachers would lead and guide their classes in the field and take a strong supervisory role in the subsequent mapping and presentation. In secondary schools, on the other hand, there might well be the opportunity for groups of pupils to carry out the survey independently as part of a coursework project, or a Duke of Edinburgh Award task.

The important constant factor was that the survey should be conducted according to the instructions provided so that there could be confidence in the comparability of different returns. Having completed the survey work, schools were required to return not only the map but a statistical analysis of percentages of different land usage in the square, calculated by

counting usage at 100 intersecting points on a 10 x 10 line template placed over the finished map.

One important extra component of the survey sought the perceptions and views of the young surveyors about the landscapes which they were surveying and also their visions of the future. The results are to be collated and analysed by a team of volunteers, led by an experienced geographer, working over the summer of 1996. The plan is that the provisional national results should be available to schools at the beginning of November 1996, in time for them to be used as a focus for activity in the projected Geography Action Week.

Early indications are that many schools are enthusiastic to take part and that the survey is seen as an ideal and timely reminder about geography and fieldwork as a distinctive component of the school curriculum for children, parents, school governors and the general public. The importance of maintaining pupil-centred fieldwork in schools in the 1990s is, perhaps, more important than it has ever been, given other competing curriculum pressures. The context of a national initiative may be an effective way of ensuring that it is high profile.

13.4 Student material

WHAT STUDENTS WILL DO IN THE LAND USE - UK PROJECT 1996

School who register for the project will receive a Survey Folder. This will include instructions for the survey, badges to authorise and identify the surveyors (who may range in age from 9 years to 18 years), a pack of coloured pencils for mapping purposes and other papers. The Ordnance Survey (the UK's mapping organisation) is providing a free 1:10,000 map to each of the participating schools.

The survey tasks are these:

1. to map a 1 sq km area according to a specified classification of 19 different land uses. The areas have been chosen by stratified sampling processes and there is a set of 1000 Key Squares at the heart of the sample.
2. to record the presence or absence in each area of certain landscape or townscape features which are currently the focus of concern. The features include : blocks of new housing built since 1990; out-of-town or fringe-of-town supermarkets and hypermarkets ; small village or neighbourhood general stores (which are thought to be disappearing fast in face of the competition from the hypermarkets); pylons and communications towers (the latter a rapidly proliferating new feature); farmland which has been 'setaside' in response to the Common Agricultural Policy of the European Union.
3. to answer the following questions, having been out in the field:
   a. What single word or short phrase describes best the CHARACTER of the area which you have surveyed?
   b. What things did you find most INTERESTING and SURPRISING in the area?
   c. What do you LIKE and DISLIKE most about the area which you surveyed?
   d. What would you say was the current major environmental ISSUE in your area?

e) What CHANGES, if any, would you like to see in the area which you surveyed?

f) What is your VISION of what the area will be like in twenty years time?

The aim of these questions is to elicit the views, perceptions and visions of young future citizens about the environment which they will inherit. Teachers are given some guidance in the Survey Folder concerning the management of discussion on these questions.

Schools will return the map, some tables of percentages and patterns of land use, a 'National Issues' form and a 'Views and Visions' form to a central Results Team who will be collating the results during the summer of 1996. Some schools will exchange their results with other schools with whom they have 'twinned'.

National results, in preliminary form, will be published in time for them to be exhibited by schools and compared with local findings during GEOGRAPHY ACTION WEEK (November 11th - 17th 1996).

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14 A STRATEGY FOR GEOGRAPHY FIELDWORK

Ashley Kent

14.1 Introduction

Over the last fifteen years the author has developed an approach to introducing student teachers to planning and teaching fieldwork and this is explained in this chapter. Underpinning this work is the author's belief in the huge social, motivational and not least intellectual benefits of engaging in fieldwork. By involving and hopefully enthusing young geography teachers in these benefits it is his belief that the future of residential fieldwork, in environments away from home, will be secured. Such a future cannot be taken for granted in the UK where curriculum and resource constraints pose a threat to such an important contribution that geography can make to a young person's education.

In the early days (alongside his colleague Michael Naish) the author organised such residential fieldwork for geography students aged from 14-18 but more recently it has had to be restricted to 16-19 year olds pursuing an 'A' level geography qualification.

14.2 Theory

The strategy as it has developed is a result of considering certain models of fieldwork -they are not sufficiently developed, written about and proven to be called theories- and a range of working principles.

In England three distinctive models of fieldwork have emerged.

These are:

- Field Teaching /Field Excursion
- Hypothesis Testing
- Framework Fieldwork

Field teaching, sometimes pejoratively called "Cook's Tour" fieldwork, has a long and established tradition. Associated with Wooldridge (1955), the objective of such field teaching was 'to develop an eye for country - i.e. to build up the power, to read a piece of country'. It is to do with a knowledgeable, skilled and often charismatic field teacher, leading a group of students to an area with which he/she is intimately associated. Field notebooks, mini lectures, field sketching and question and answer sessions are typical teaching strategies used. Its strengths as an approach include a direct (through the soles of one's feet!) experience of a new environment and having it interpreted in a holistic fashion by an expert. On the down side this can become a tedious and passive exercise.

The hypothesis testing tradition emerged in schools in the nineteen sixties and seventies and is still arguably an entrenched and accepted approach. It reflected the quantitative, spatial scientific nature of Anglo-American geography of the time. Particularly influential on schools

were the writings of Everson (1969, 1973) and Chapallaz et al. (1970). Its strengths include a focussing of activity around a testable hypothesis and the rigour of statistical techniques used. On the other hand too much emphasis can be given to data collection focused round highly specific and sometimes socially and environmentally irrelevant statements.

Another approach to emerge has been that of 'framework fieldwork' a term first coined by Hart in 1983 and formalised in the Geography 16-19 Project Teachers' Handbook (Naish et al. 1987). Figure 14.1 summarises this approach. It is to do with fieldwork being 'framed' around a specific people-environment question, issue or problem. It strengths are that the fieldwork centres on questions and issues of social and environmental concern and appropriate techniques of data collection are utilised where and when appropriate. However this does not allow for a holistic look at and appreciation of environments nor does it allow specific studies of physical and/or human environments (and related processes) for their own sakes.

Other approaches to fieldwork have been of a more sensory nature as proposed by Van Matre (1979) and colleagues, a part of the earth education movement in the USA. Hawkins (1987) echoes some of these suggestions.

When planning fieldwork experiences with student teachers, it is this author's approach to introduce these three models first of all and then to encourage the incorporation of them into the fieldwork being planned. Such a variety of fieldwork strategies and related data collection and analysis techniques allow the benefits to be gained from the distinctive strengths of each approach and for a balance between cognitive and affective experiences to be reached. Important critiques of existing fieldwork approaches, for example Harvey (1991) and Job (1996a and 1996b) suggest that a balance is desirable and that strategies should not slavishly follow one of the three accepted fieldwork paradigms.

In addition to encouraging a range of strategies to be used when planning a fieldwork week, this author adopts various working principles. Some of these are listed below:

- As the Chinese proverb is supposed to say:

  I hear and I forget
  I see and I remember
  I do and I understand

  The message is one learns by doing and student teachers are given considerable autonomy (and not a little anxiety!) in planning modules of work.
- Student teachers work in teams of 2/3/4 to share burdens and expertise.
- Regular inter team meetings are held to share ideas and report on progress. Vital critical and constructive comment is received at these meetings.
- The 'frisson' or 'edge' to this planning process is given by the imminent arrival of school students! It is not just a theoretical exercise. It is practical and has an audience!
- Wherever possible the messages of the Global Futures Project (Hicks & Holden 1995) are interwoven with the planning of the modules. In particular preferred and probable futures are considered.
- Careful detailed planning is essential and all students and teachers involved are fully informed of the organisation of the day and where their contribution fits.
- Time and space for school students to admire, wonder at and enjoy these different environments must be found.

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- Student teachers need first to become familiar with local geographies and then consider the focus and teaching strategies appropriate for their module(s).

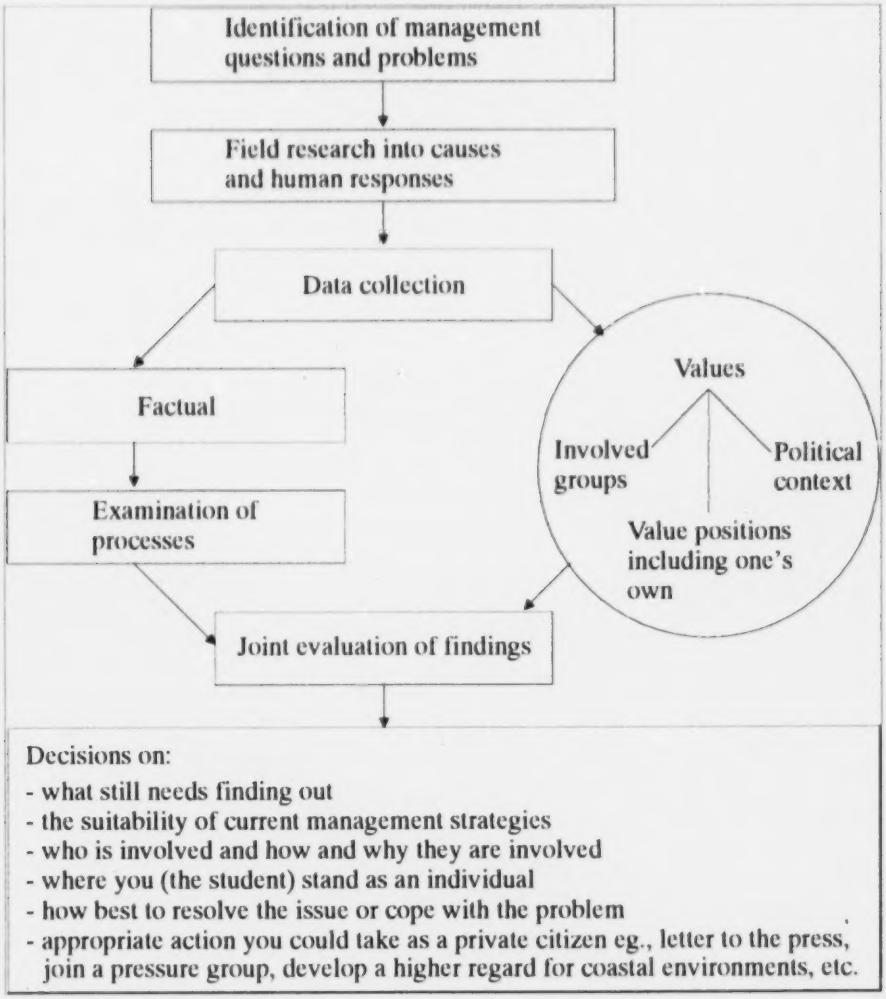
Identification of management questions and problems
Field research into causes and human responses
Data collection
Factual
Examination of processes
Values
Involved groups
Political context
Value positions including one's own
Joint evaluation of findings
Decisions on:
- what still needs finding out
- the suitability of current management strategies
- who is involved and how and why they are involved
- where you (the student) stand as an individual
- how best to resolve the issue or cope with the problem
- appropriate action you could take as a private citizen eg., letter to the press, join a pressure group, develop a higher regard for coastal environments, etc.

Figure 14.1 Framework fieldwork

14.3 Methods

The stages of this fieldwork strategy for student teachers is illustrated in Figure 14.2. As the reader can see, the schedule goes from November to June of the year in which the student teacher is undertaking her PGCE (Post Graduate Certificate in Education). The flow diagram is self explicit but one or two additional points need making. First is that for the author's sanity and interest a different location is usually chosen each year!. They have varied from Jersey in 1981, to South Wales in 1985, to Norfolk in 1990, Cévennes in 1991, to the Yorkshire Dales in 1994. A key element is the trust between geography teachers and university tutor. The former must 'dare' to allow the student teachers to have their heads! Local 'resources' at the fieldwork location chosen are invaluable. These include local field study centre tutors; local geography teachers in schools and universities; planners; national park officers; local newspapers, libraries etc etc.

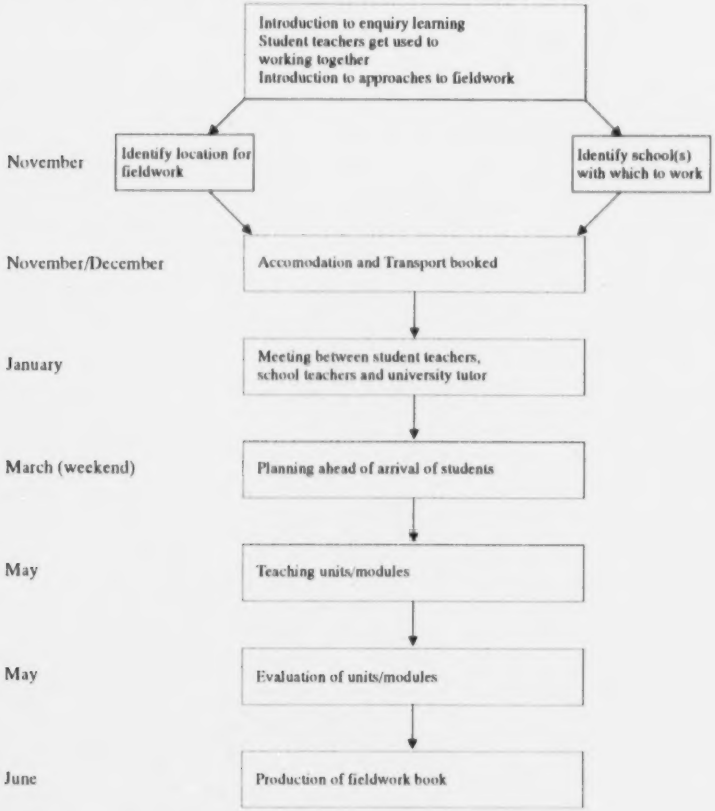

Figure 14.2 The fieldwork strategy in stages

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14.4 Student material

An example of a week's fieldwork outline is given in figure 14.3. An example of part of a unit on farm change in South Devon is illustrated in figure 14.4. Figure 14.5 outlines part of an exercise focussing on ecosystems in Dartmoor. However these, given the space available in this chapter, are partial so the books [1] written by the participants in each year's fieldwork need ideally to be consulted, e.g. see Cévennes (1992), Blencathra (Lake District) (1994) and Courtlands (South Devon) (1996).

To give a flavour of how teachers and student teachers evaluate such experiences two comments are included from a teacher colleague and a former student teacher who has two perspectives on the exercise (figures 14.6 and 14.7), first as a student teacher and then as a newly qualified teacher.

School students thoroughly enjoy the week of fieldwork for a variety of reasons. These include the careful, thorough and detailed planning of each module; the in depth tuition they receive from student teachers; and the challenging, demanding and relevant nature of the work.

MONDAY	late afternoon	Walks in small groups around the Field Centre.
	evening	Talk on the area by Rob Lucas, touching upon the issue to be covered during the week.
TUESDAY	am	Managing Landform Systems (Core)
	pm	Choice of option modules
WEDNESDAY	am	Changing Agricultural Systems (Core)
	pm	Choice of option modules
THURSDAY	am and pm	Sellafield visit and Ecosystems and Human Activity (Core)
	evening	Talk by Friends of the Earth speaker on Nuclear Power
FRIDAY	am	The Impact of Manufacturing Industry (Core)
	pm	Choice of option modules
SATURDAY	am	Choice of option modules
	pm	Choice of option modules
SUNDAY		Travel Home

Option Modules

- The Demand for Recreation and Leisure
- Water Resource Management
- Rural Management
- Forestry management
- Soils as a Resource
- Mobility and the Environment

Figure 14.3 A fieldwork week (at Blencathra Filed Study Centre)

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Key Questions 'framing' the fieldwork

- What have been the recent changes in agriculture in South Hams?
- What factors are affecting change in the agriculture of South Hams?
- Are government attempts to influence agricultural change successful?
- What influence has recent agricultural change had on the landscape and environment of the area?
- What changes can be predicted for the future?

Questions to the farmers

1 a) What is the size of the farm?
b) Has this changed since 1980?
c) Are any changes foreseen?

2 What is the physical nature of the farm (soil type, depth, texture, permeability, pH, microclimate)?

3 What percentage of the land is devoted to these activities, how has this changed since 1980, and what changes are likely by 2005? (Beef cattle, dairy cattle, sheep, wheat, other cereals, vegetables, forestry and unused)

4 a) Do you own the farm?
b) If yes did you buy or inherit, and how long has the farm been in your family?
c) If no who owns the farm?
d) Does the nature of your tenure affect your decisions, especially forward planning?

5 The farmers were asked about production levels on their farm and how this had changed since 1980, and what changes were foreseen by 2005.

6 The farmers were asked about number of employees, use of machinery and use of pesticides, herbicides etc, how this has changed and what future changes are predicted.

7 The farmers were asked about the effects of EC and government policies upon their business, and the impact of these upon future planning.

8 This question only applied to Bullhornestone farm. In what ways does being within the Dartmoor National Park influence farm activities?

9 The farmers were asked to place the following factors in order of importance:
a) Profitability, Independence, Family tradition, Pride in a good job, Investment for the future, Farming as a way of life.
b) Soil type, Market conditions, Slope, EC and government policy, Conservation, Tenure or ownership, Aspect.

The farmers were asked to add any other factors which were felt to be important.

10 The farmers were asked about any past, current or planned diversification.

Figure 14.4 *Part of a unit on farm changes*

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Hypothesis:
Explanations for the existence of a variety of habitats in the Dartmoor National Park centre more on the use of the land by people than the influence of physical factors.
Aims:
This module aims to introduce the concept of ecosystems
using the example of the Dartmoor National Park. It examines the extent to which the various habitats within the Dartmoor ecosystems have been modified by people. This is to be done by:

1) Examining the different environments in which particular ecosystems exist.
2) Examining the influence of climate, relief, soil, vegetation, animals and people within each ecosystem - noting the interrelationships between the component parts.
3) Considering the ways in which human activity has resulted in change, producing modified ecosystems.

Key Questions:

1) What are the range of ecosystems in the Dartmoor National Park ?
2) In which environments do these ecosystems exist ?
3) What are the various factors influencing the establishment of certain ecosystems and what is the relationship between them ?
4) How has human activity changed and modified these ecosystems ?
5) How could the management of these ecosystems be improved by the National Parks Authority for the future ?

Links With The 'A' Level:
This module will look at the following aspects of the 'A' level syllabus:

1) How do plant and animal ecosystems pose challenges for people and influence their activities ?
2) Why and how are people an important component of plant and animal ecosystems ?
3) How can the human role within ecosystems be better managed for the future ?

Figure 14.5 *The challenge of natural environments: ecosystems and human activity. Ecosystems within the Dartmoor National Park*

The background
For the past two years I have been able to participate, with groups of lower sixth A-level students from Ravens Wood School, in residential fieldwork organised in collaboration with Ashley Kent of the Institute of Education.
In April 1990 I accompanied my students on a week of residential fieldwork in Cromer, Norfolk and in April 1991 to the Eagle's Nest Field Centre in the Cévennes, France.
Planning the fieldwork
Each years fieldwork has commenced with an initial meeting between Ashley Kent, a group of student teachers and the teaching staff from the schools participating in the venture. These have been key meetings for all involved, as they have provided an important planning session at which formative ideas and plans concerning the preparation of fieldwork activities and teaching approaches can be raised in the context of examination syllabuses and the experiences and needs of individual groups of A-level students.
From this first stage the PGCE students are provided with a number of "teacher - enhancing" experiences that they may not have encountered during their teaching practices.

Figure 14.6a *An experienced teacher's perspective (Ann Wood) Part I*

Collaborative working

The students are given an opportunity to work collaboratively within a team of both PGCE students and qualified staff. This is important as not all PGCE students would have found themselves in departments which offered them the experience of being able to formulate ideas in a mutually supportive environment, while enhancing individual skills. This approach to developing suitable fieldwork and teaching approaches is one that is adopted from this initial planning stage through to the actual fieldwork delivery and then to the final evaluation.

Developing fieldwork skills

Many PGCE students do not have the opportunity to teach in the field during their teaching practices, or to have participated in preparing appropriate fieldwork materials related to examination syllabuses. In fact some PGCE students may not have experienced fieldwork at first hand since their undergraduate days, when activities may have been very different to those relevant to A-level pupils of the 1990s. Therefore, the provision of such a fieldwork component to a teacher training course, particularly as it is residential, is of considerable benefit to the PGCE students in a number of respects. Firstly it allows student teachers to develop the sense that fieldwork is an integral component to the teaching of geography. Secondly, it provides student teachers with a valuable experience in their career development; an opportunity for which they may otherwise have had to wait a number of yers.

The process of developing an individual's fieldwork skills is not an area which is exclusively available to the PGCE students, as each year qualified staff have also benefited from the fieldwork experiences.

A-level teaching experience

The residential fieldwork provides an opportunity for the PGCE students involved to teach A-level pupils, therefore complementing and extending the experiences gained through their teaching practices.

Working under a time constraint

The PGCE students are put in a situation all too familiar to practising teachers, whereby they have to divide a limited amount of preparation time amongst a number of tasks which need to be accomplished

Despite the fact that the PGCE students are guided in the preparation of fieldwork activities by qualified staff, it must be acknowledged that many of them do experience a sense of working under pressure, with limited resources. This is clearly an opportunity for the student teachers to further their skills, developed on their teaching practice, in managing their time so that relevant tasks are achieved while maintaining an element of creativity and freshness.

Even though initially unpopular with the student teachers, I do believe it is vital that our departmental colleagues of the future need to be appropriately trained in how to deal with the real pressures of daily life as a teacher and should therefore be an essential component of any course. However, in our role as trained and experienced staff we shouldn't just throw students or probationary teachers in at the deep end, but we should ensure that we have taught them sufficient skills in order to keep their heads above water and then swim a length! Such a collaboration between the Institute of Education and schools allows this process to occur.

Creativity versus the syllabus.

One of the key skills that the student teachers should develop is that of being able to evaluate their own ideas in order to discover the relevance of planned fieldwork activities to the examination syllabus and the background of the A level students involved This process can sometimes be a little uncomfortable as students realise that certain activities may be potentially fun to carry out for the A level students but have limited value in the context of enquiry based fieldwork aimed at extending pupils . In common with teaching experience within the classroom, the practical experience of guiding A level students to investigate a theme in the field cannot be substituted or underestimated.

Figure 14.6b An experienced teacher's perspective (Ann Wood) Part II

I have now attended two fieldwork weeks organised by the Institute of Education and have viewed them from two very different perspectives. In 1990 as a student teacher I was thrown into the task of preparing, from scratch, one week of 16-19 A level fieldwork to suit the needs of various teachers and students, whilst this year, as a teacher, I have brought my sixth formers to a week's fieldwork where I have had absolutely no prior knowledge of the content of the week's work . From these positions I would like to reflect on the value of these fieldwork programmes.

As a student teacher I had completed my two sessions of teaching practice when my colleagues and I were whisked off to Norfolk for a weekend, with the daunting task of setting up a week's fieldwork in that time. Not surprisingly the first thought that hit us was that one weekend could not possibly be long enough. The area was alien to us and we had never prepared fieldwork before. What better reason to do this!

The weekend drew on, and extended skills that, as my teaching experience this year has proved, are a necessary component of the 'survival skills' teachers need.

1. Time is never on your side; The pressure that the student teachers in France were under in the four days before 34 pupils arrived for their polished fieldwork course is unfortunately ubiquitous in the daily school routine. The exposure as student teachers to this pressure should, I believe, be a component of the PGCE course. As a student teacher I may have thought differently but on reflection I see the experience as invaluable.
2. Creating something from nothing; To arrive in an area and transform a landscape into meaningful, relevant, enquiry-based, and manageable fieldwork units is a skill that can only be acquired through practice. No amount of discussion or classroom exercises can substitute for this. What the student teachers produce is a week of unique, fresh fieldwork.
3. Working as a team; The teaching practice experience does not necessarily involve the student teacher as an integral member of a team or department. Not all departments open themselves up to their students as they perhaps could, and not every student has the confidence in a strange environment to impose themselves. To succeed as a teacher one needs to be able to fit into a department that may not necessarily be to one's own liking. A tutor group on PGCE fieldwork acts very much as a department where success depends on delegation, co-operation, use of scarce resources, utilising the particular skills of each member, and support.
4. Field teaching practice; A basic point but worth making nonetheless, is that student teachers rarely get an opportunity to teach in the field on their teaching practice, let alone create fieldwork resources, so this part of the PGCE is covering an area that would otherwise be omitted from the student's experience of teaching.
5. Fieldwork as part of geography teaching; Integral is a word that springs to mind. This can be justified in so many ways and it is not the purpose of this evaluation to do so, suffice to say that the assumption that it IS integral underpins this writing.

Figure 14.7a A student teacher - newly qualified teacher's perspective (Jon Hunter) Part I

6. The key point: *"yes that's all very well, but what is the key point/s you are trying to get across?"* This question, that was asked of me so many times over lesson plans for conventional classroom teaching, really hits home when preparing fieldwork. A group of 30-40 A level students spread up a stream with flow meters, ranging poles, tape measures and orange peel(!) on a freezing April morning in the Cévennes National Park need to have an aim. They may not be fully aware of it at the same time but the days work needs to be focused. A programme that does not concentrate on specific investigations, but instead relies on basic observation and descriptive geography of the type 16-19 was precisely designed to escape from, is too easy to produce. Yet it is precisely this strain of geography that will be invariably leaned on by the inexperienced teacher. Having a small group of PGCE students working under the guidance of a 16-19 tutor to specific aims can help eliminate the sort of 'tour guide' fieldwork that leaves pupils unmotivated, unattached and tied to their personal stereos. Every effort is made on these weeks to give pupils a specific task, a reason for doing it, and a full summing up/evaluation in the evening. At the end of the evening the student teachers, pupils and school staff are normally to be expected to be able to answer that key question. Over the two years I've been associated with the trips that has usually, not always, been the case, but it is a learning experience for the student teachers and that is why the support from school staff and Ashley Kent is invaluable.

In terms of organisation the trips work well: The students are mixed so they are forced to work outside of their school groups, the flexibility of mini-buses is utilised and multi-locational study means no 'swamping' of places. The student teachers run the show, liaising on a daily basis with teachers who can occasionally help shape the days work where they feel it necessary. This can lead to toes being trodden on but it's a learning process for everyone.

Another key factor to fieldwork - ENJOYMENT. There is plenty of this, and the mixing of the students leads to good pan-London social links. The A level field trip is frequently the part of the course most remembered long after Spearmans Rank and Biosphere Reserves are forgotten. If I owe my degree to climbing Cader Idris then hopefully some of this years lower sixth may owe their A level to Le Pont de Montvert or l'Hopital. I hope so.

Figure 14.7b A student teacher - newly qualified teacher's perspective (Jon Hunter) Part II

14.5 Conclusion

This model for residential fieldwork planning, teaching and evaluation has been a highlight of the geography initial teacher training (PGCE) course at the London Institute of Education for several years. At the time student teachers find it demanding, exhausting, and a cause for concern but after the event, the enjoyment and long term professional benefits are fully appreciated as Jon Hunter explains in figure 14.7.

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Note

[1] These books are written by the student teachers after they have completed the fieldwork and are edited by their tutor. They consist of self contained modules of fieldwork.

15 INVOLVEMENT, THE KEY TO ENVIRONMENTAL EDUCATION

Henk van Dijk and Lex Stomp

15.1 Introduction

Recently in a secondary school somewhere in the Netherlands, over 150 pupils (age 12/13) were performing a dance production about Antarctica. They performed dances on themes such as climate, the extinction of the Polar Bear, the life of the Whale, nuclear tests and pollution, all being expressed with enthusiasm. At the end of the evening the children were pointing at their parents as the persons being responsible for the problems occurring in Antarctica.

Analysing this event, three elements may be distinguished:

1 The enormous involvement of the children during preparation and performance of the dance.
2 The mistakes in the content. Polar Bears never lived in Antartica. Nuclear tests were never performed in the area.
3 The lack of action-possibilities for the children themselves with regard to the themes mentioned.

In this article we will emphasize the need for a balanced approach of 'involvement', 'contents' and 'action-possibilities for the pupils'.

15.2 Recent research in the Netherlands

Research on environmental education in the Netherlands performed by the Dutch CITO-institute[1] shows that the different elements knowledge, attitude and behaviour are not strongly related (Kuhlemeier et al. 1995).

The research gives some examples to illustrate the lack of knowledge. Less than 50% of the 6000 children in the inquiry knew that cut-flowers and potatoes are grown by using herbicides. Less than 25% of them are familiar with the concept of 'Environmental Effect Studies' a study required for all the important developments in the Netherlands like High Speed Trains or the expansion of Schiphol Airport.

Their lack of knowledge however does not mean that they have a negative attitude towards the environment. Only 1% has a negative attitude, 43% are neutral and 55% have a positive attitude.

Regarding the behaviour of the pupils, 53% act environmentally-friendly. They use water and electricity economically, put their empty bottles in a bottle-bank, write on both sides of their paper, etc. Only 1% act environmentally-unfriendly and 46% show mixed behaviour.

Kuhlemeier et al. (1995) conclude from this research:

> *'What pupils know about environmental problems has hardly any influence on their environmental attitudes and on how environmentally friendly they act in daily life'.*

15.3 Objectives for environmental education

The examples given show that there might be some problems with the main objective of environmental education in the Netherlands.
The objective is:

> *"Teaching pupils how, within the relationship between man and environment, they can contribute to the emergence of sustainable development" (Stomp et al. 1991).*

This objective is based upon the assumption that knowledge about the relationship between man and environment will lead to environmentally-friendly behaviour and actions.
There is some friction within this aim because it clearly refers to influencing the behaviour of the pupils. In the first place, friction is caused by a collision of political and pedagogical aims. Secondly, friction is caused by the fact that it is not proven that knowledge will automatically lead to actions according to this knowledge (Kuhlemeier et al. 1994).
From the first remark, it may be clear that in the Netherlands the main aim is also a political one. The environmental plans of the government emphasize environmental education as an instrument of environmental policies[2]. The question is whether this legitimizes such a strong grip on environmental education. Education should in fact be determined by pedagogical objectives rather than political ones. Then of course it is important to find pedagogical reasons for this objective. For this we must consider society as a context for educational objectives. Education must prepare pupils for their roles in society. Our modern society is changing rapidly, the future is hardly predictable and pedagogical points of view should take this into account. Pupils must be prepared to find their own way in a dynamic society, in which they have some influence, but in which they will not be able to determine the outcome. All education must help pupils to give meaning to an open future and show them the way to use their influence according to their objectives (Boersma et al. 1988).
The second remark is even more important to education. Is influencing behaviour a possible objective? Can this be realised in educational situations? Even if we are not sure about this, environmental education should provide pupils with knowledge and awareness of environmental issues and give them the skills to behave in an environmentally-friendly manner.
With regard to both remarks it is important that pupils are able to make choices from a range of personal behavioural dispositions on the basis of their own evaluations of the situation (Boersma et al. 1988). Thus the heart of environmental education should be: the 'free' ability to make the right decisions, weighing individual and common interests, based upon knowledge of the issue involved.
This may raise some problems:

- there are discrepancies between what we think and how we act, mostly based upon the principles of profit and short term views;
- individual behaviour can differ from the behaviour of the group/society to which we belong, which might be frustrating;
- the factors age and income have a great influence on environmental behaviour (Boersma et al. 1988).

So, errors in contents and the absence of connections between knowledge and attitudes and between attitudes and behaviour are the key issues to be met in choosing or developing teaching materials for environmental education.

15.4 Three key-elements

In the next part of this chapter we will focus on the three key elements of environmental education:

1 Involvement (feelings, attitudes, emotions).
2 Understanding (knowledge, skills).
3 Decision-making (actions).

Each of these elements must be used to produce teaching materials for environmental education. They should be the basis of the frame of concepts and of teaching methods for environmental education.

15.4.1 Involvement

Involvement is a basic attitude which is important to be reached with pupils. Hence, maybe this element is the most neglected in geographical contributions to environmental education. In most modern teaching materials a lot of emphasis is put on this aspect. This can be illustrated by the following quotation:

> *"An essential starting point for environmental experience is that nature is not only the scene for your learning activity but becomes a part of it. You become partially dependent from nature. Use while being out your feet, eyes, nose and ears and enjoy it! Practise all your senses to become sensitive to the many aspects of nature" (BRES 1995).*

Working on the involvement of the pupils should be conducted very carefully. One of the worst things to do is to confront young children too early with huge problems which they can never solve themselves, e.g. air-pollution. This will only give them feelings of guilt and powerlessness; involvement should therefore be broken down in this way.

With pupils we should develop:

- feelings of care and respect for the environment;
- a receptive attitude towards the environment;
- a sense of wonder for common things.

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Involvement is an important educational foundation, for it raises the motivation of pupils to act positively towards the environment. If involvement is founded and developed more thoroughly we can then turn to the more distant and larger environmental issues, preferably in secondary education.

15.4.2 Understanding

Knowledge of and insight into nature and environment are very important, because without them we can never define the environmental issues to which we have to address ourselves. Knowledge leads to an understanding of the vital importance of environment to mankind.
Based upon 'involvement' it is important to start with that which the children are most involved with and have some knowledge of, that is, their everyday environment. The 'personal environment' must be the starting point for fieldwork and simple investigations performed by pupils. Here the focus must be on relating to environmental problems in their neighbourhood. Because pupils know much about their own environment, use may also be made of their perception of it. Starting with that, we will also be motivating them.
Again later on we can widen this field of research to those issues which are further away from their everyday surroundings.

15.4.3 Decision-making

If a foundation of involvement and understanding has been laid, it becomes important to work on the behaviour of the pupils. For this it is essential to let them make decisions in environmental case-studies. This means that they should become able to carry out simple research and to confront different opinions.
A basic part of the process of decision-making is being able to communicate values. Decision-making must also be linked to their capability to influence public life, because it is there that the decisions are made which really affect the environment (Kortland et al. 1992).
Therefore, decision-making must be dealt with both at the individual level and at the level of the community/society.
As stated before, environmental education aims at environmentally responsible behaviour. This behaviour is now commonly defined as, "to live and act in such a way that 'sustainable development'[3] becomes possible.

15.5 A basic model for environmental education

Teaching environmental education should consequently be based upon a set of conditions:
a that relate to 'involvement':
   - the personal motivation of the pupils to work on the subject/project must be raised, e.g. by referring to their 'personal environment';

b that relate to 'knowledge' (understanding):

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- the role of the teacher is to accommodate the learning process and to present the right contents;
- the learning process must also be aimed at the questions of values and judgement, which means attention to the moral development of pupils;
- fieldwork in the 'personal environment' and the use of other appropriate sources are vital to the process;

c that relate to 'individual and social behaviour' (decision-making):

- the process must have the perspective of behaviour and actual decision-making;
- the larger and more distant environmental issues should be addressed at a later stage, with attention being given to the item of behaviour.

From this we may conclude that every (set of) lesson(s) in environmental education must contain the elements of the Figure 15.1.

Figure 15.1 Framework for environmental education

It is important that when teaching, these elements are addressed in the given order. They are phases in the teaching process. It is of course possible in every phase of the process to return to an element which has been used before.
The elements of this model will now be used in an example case-study about water. From the example, we will aim to derive a set of criteria that may be used in developing or choosing teaching materials for environmental education.

15.6 Case-study

In the national curriculum for geography in the Netherlands for children aged from 12-15 years, 'the personal environment' is a major subject. This domain is also an important contribution from geography to the cross-curricular theme of environmental education. Within this domain inquiry-learning is a central issue.

15.6.1 Introduction

The Netherlands is a country strongly related to water. Estuaries, lakes, rivers the water is never far away. One of the Rhine-branches is the river IJssel, flowing to the North until it finally discharges into the Lake IJsselmeer (see Figure 15.2).
Zwolle, the capital of the province of Overijssel is located very close to the river's mouth. The city has approximately 100,000 inhabitants and it functions as a major service centre for the surrounding area.

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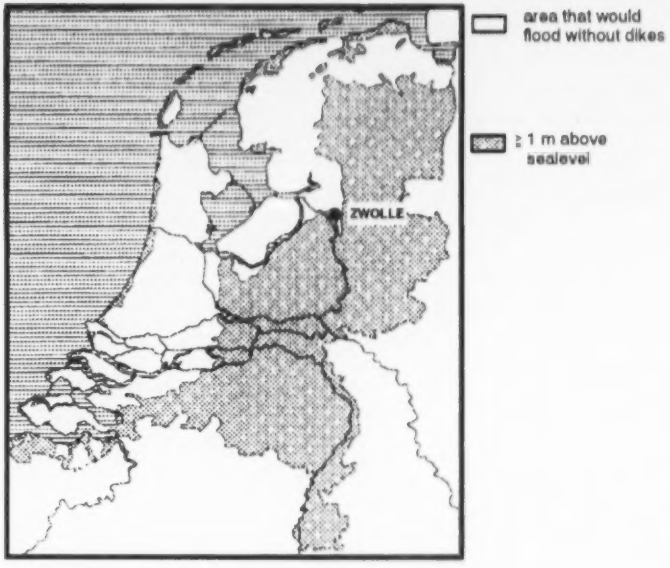

Figure 15.2 Zwolle, The Netherlands

15.6.2 Phase 1: Involvement

Activities
Together with their teacher, the pupils from a secondary school in Zwolle cycle to the river. In smaller groups they pay a short visit to the bird-sanctuary which is located in the area near the river (see Figure 15.3). All kinds of birds crowd the shallow water of the river's levée. After some time the group cycles back to school through the nearby park. The teacher points out the location of the water collection points and the waterworks (WMO)[4] in the park.
Objectives
The pupils enjoy the landscape, the beautiful birds, being out and working together in the field (experience, emotion, involvement).

15.6.3 Phase 2a: Knowledge

Activities
Back in school the pupils study various ordnance survey maps of the area which they have visited. Comparing maps from different dates shows that the water-area is a rather recent feature of this landscape. Using folders, leaflets and their own knowledge from geography and biology, the pupils find out that the number and diversity of wild-life in the area may be related to the ecological gradients in the area (dry-wet, high-low, deep-shallow water). They

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may conclude that man has changed the landscape (nature development) in order to enlarge the biodiversity.

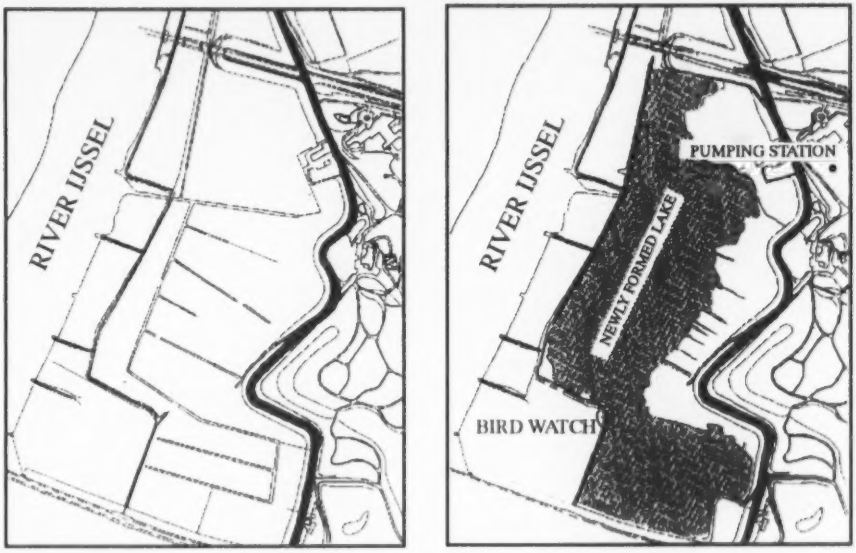

Figure 15.3 Landscape change along the river IJssel

Objectives
The pupils develop an understanding of ecosystems and the objectives that are involved in nature development (cognitive development).

15.6.4 Phase 2b: Knowledge

Activities
The group pays a visit to the information centre of WMO. They see where the water is collected and cleaned before it can be used for consumption.
Another aspect shown to them is the (financial) involvement of WMO in the nature development mentioned above. The water in the artificial lake is used for infiltration and later, after natural cleaning, it is pumped up again for consumption (see Figure 15.4). Towards the end of their visit, the growing consumption of water is mentioned as well as the problems encountered in producing water of good quality.

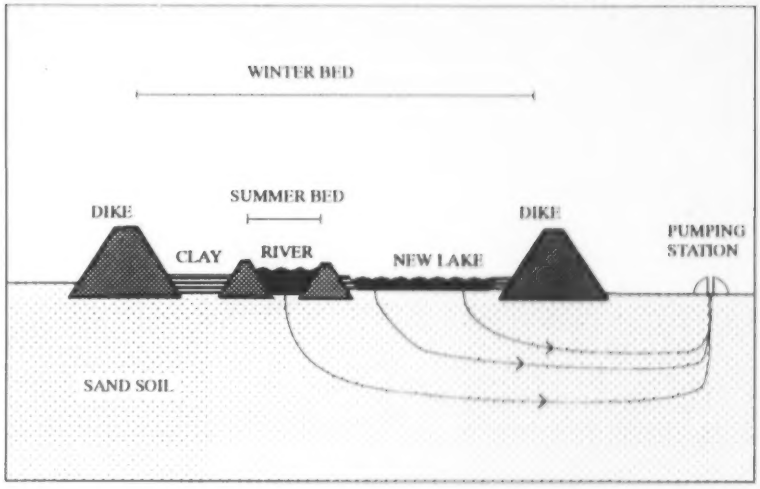

Figure 15.4 Cross-section of the river IJssel

Objectives
The pupils learn how water for consumption is produced and they learn about the role of the nature development project they visited. They also become more aware of the growing problems in water production caused by the increasing consumption of water (cognitive development).

15.6.5 Phase 3: Individual behaviour

Activities
The pupils are asked to do a simple inquiry. They must keep notes about their own use of water at home for a week (drinking, showers, bath, toilet, brushing teeth, cooking, cleaning etc.). They also should try to find out how many cubic metres of water are used each year in their household. Back at school they compare their results.
After this they are asked how they could reduce their own use of water. Government TV-commercials on this theme can help to give ideas. As a follow-up to this discussion, individual pupils can set themselves one or two targets to reduce their level of personal water use.
Objectives
The pupils become aware of their own behaviour and the (im)possibilities of changing this behaviour in relation to their attitudes and knowledge (acting, behaviour).

15.6.6 Intermezzo: Knowledge (return to an earlier phase)

Activities
Focusing on water consumption other than in their own households, the pupils are asked who else uses water. Using statistics they will find out which share of clean water has been used by agriculture and industry. Optionally they can pay a visit to a farm, an industry- or energy production plant (cooling water) and inform themselves about the use of water in these enterprises.
Objectives
The pupils learn about water consumption by non-domestic users (cognitive development, knowledge).

15.6.7 Phase 4: Social behaviour

Activities
To connect to their everyday environment the pupils investigate the use of water within their own school. They develop a plan to reduce the use of water at school. They can write a letter with their proposals to the pupil's council and ask the council to discuss their proposals with the school-management.
Objectives
The pupils analyse the behaviour of others and react to others. They experience the restrictions and the possibilities of changing things at a more structural level (cognitive development and acting).

15.7 Criteria for the choice or development of teaching materials

In our model we showed the phases of the teaching process in environmental education. We used these phases in the case-study. If we analyse the case-study, we can identify important elements to use in teaching in each phase.
Elements of 'involvement' are: aesthetics, care, respect, responsibility, recognition, experiences, perceptions, observations.
Elements of 'knowledge' are: previous knowledge, understanding, to put in your own words, applied knowledge, to develop a critical point of view.
Elements of 'individual behaviour' are: involvement, to grant meaning to, problem solving at an individual level, to take action, reflection.
Elements of 'social behaviour' are: involvement, problem solving at a more general level, exercise influence, to consider the effects of behaviour.
If we use the phases and elements mentioned we can develop criteria for the contents of the lessons. We may combine our phases and elements with the contents for environmental education given by Alblas et al. (1993).

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Table 15.1

elements	contents	example
phase 1: involvement		
aesthetics	to enjoy something for its beauty	cycle through the landscape
care, respect, responsibility	possibility to take care of	care for a plant or an animal
recognition	elements from everyday life and surroundings	studying plants in the school gardens
experiences, perceptions, observations,	experiments to taste, to feel, to hear or to see	feel the differences between various leaves
phase 2: knowledge		
foreknowledge	relate to previous knowledge or experiences	question the previous knowledge
understanding	learn new contents and internalize them	let pupils rephrase it in their own words
applied knowledge	apply knowledge to solve a problem	where to locate a chemical-plant?
points of view	apply knowledge to give an opinion	should we separate waste?
phase 3: individual behaviour		
involvement	personal involvement	how environmentally-friendly am I?
grant meaning to	meaning in everyday life	do I need this consumption article?
individual problem solving, take action	choices at the individual level	do I participate in 'air-miles'?
reflection	consider effects of choices	do my activities contribute to a cleaner environment?
phase 4: social behaviour		
involvement	group interests	undertake a neighbourhood - cleaning action
general problem solving, influence	choices at a collective level	the 5th runway for 'Schiphol' airport
consider effects of behaviour	weighing effects of collective actions	social, economic and ecologic effects of 'high-speed' trains

A teacher can use this list as a basis to choose or develop teaching materials for environmental

education. In doing so, one explicitly refers to the involvement and the behaviour of the pupils, which as we have seen at the beginning, is a poorly developed aspect of the teaching of environmental education.

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Notes

1 CITO-institute: an institute that develops central examinations for the school-subjects. It also researches the outcomes of the examinations.
2 Environmental education is an instrument of environmental policy in the Netherlands (National Environmental Policy Plan Plus, 1992).
3 Sustainable development as defined by the Brundtland Committee (UNCED 1987: Our Common Future): 'a development in which our dealings with the environment are adjusted to the needs of our own, distant and future generations'.
4 WMO - The public watercompany of Overijssel.

16 PRELIMINARY EXPLORATION OF DECISION MAKING IN GEOGRAPHY LESSONS

Ietje Veldman

16.1 Introduction

Until a few years ago, Dutch geographical education focused especially upon the enlargement of knowledge and the understanding of geographical problems. With the introduction of a new curriculum in Dutch junior secondary education (1993), programmes now also refer to the development of the necessary skills relating to the knowledge elements. In the curriculum, a distinction is made between research, map reading and decision making skills. The proposals for Dutch senior secondary education (to be introduced in 1998), also show objectives focused upon the acquisition of skills.

In the curriculum for junior geography, a scheme is presented illustrating a series of distinctive steps which pupils will have to learn in order to come to an opinion or a decision. However, research results that show the experiences of teachers and pupils in working with such a set of steps or in working in any other way on decision making in the classroom are still lacking. In this situation, it is very difficult for teacher-trainers to prepare their students properly for the task of handling decision making in geography lessons.

This chapter presents the first results of a preliminary exploration of the experiences of geography teachers on the possibilities, limitations and problems when working on decision making with their pupils.

The teachers involved in this exploration act as mentor to our students during their teaching practice. In so doing these teachers play a definite role in the education of our teacher trainees.

16.2 Theory

16.2.1 Decision making as a process

One possible description of decision making is the making of reasoned choices from among alternative courses of action (concerning a personal or public issue), which require judgments in terms of one's values (Cassidy & Kurfman 1977). This description of decision making reflects a process. The character of the process of decision making can be described using a normative model. Various normative models are to be found in the literature (Brim et al. 1962). All models have in common the fact that a number of steps are distinguished which are important to decision making: problem identification, developing criteria, generating and

evaluating alternatives and finally, choosing the best solution. An example of a normative model for decision making (Carrol & Johnson 1990) is shown in Figure 16.1.

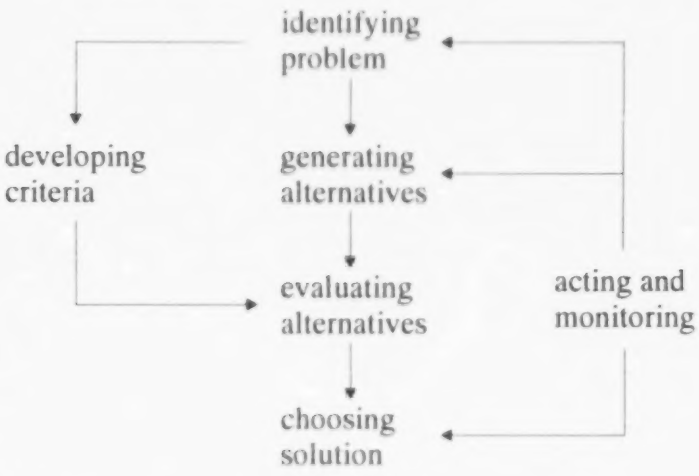

Figure 16.1 A normative model for the decision making process

The teachers involved in this research were asked what they considered to be the most important elements of decision making. In their answers, the most common elements were dilemma, facts, values and evaluation. Fitting these elements of decision making into the normative model leads to the following adaptation. 'Dilemma' may be linked to problem identification; 'facts' may be ranged under the development of alternatives and criteria; 'values' play a role in the development of criteria, and 'evaluation' takes place before choosing the best alternative.

In everyday life, decision making does not always proceed along the steps prescribed in the normative model. Empirical research points out that the different steps in the procedure are not separate from each other. During the first phase of the process, alternatives are already being developed and evaluated (Witte 1972). As a consequence, at a rather early stage, a tendency can emerge towards one alternative. The advantages and disadvantages of the other alternatives will then be neglected (Janis & Mann 1977). Empirical research also reveals that the formulation of criteria (on the basis of which the alternatives are evaluated) is not done beforehand. Development of criteria occurs in interaction with the evaluation of alternatives. First, the consequences of alternatives are considered in order to generate and select criteria for later judgment. Adjustment of selected criteria leads eventually to the choosing of an alternative (Simon 1976).

Although in everyday life decision making takes place in a different way from that prescribed in the normative model, such a model may have its uses in education. For example, a teacher

could use the model to structure the subject matter. Pupils could use the model as a 'checklist' so as not to forget important aspects of a process.

16.3 Methods

16.3.1 A set of steps in the educational practice of geography

In the geography curriculum for junior secondary education (1992) a proposal is made to structure the decision making process along a number of steps. This so-called 'set of steps' is shown in Figure 16.2.

step **1**	what is the problem?
step **2**	who are involved?
step **3**	what is the decision of the people who are involved?
step **4**	what are the arguments of the people involved for their decision?
step **5**	what is your decision?

Figure 16.2 Set of steps for decision making in the Dutch geography curriculum

Using the above set of steps, one of the teachers involved in this research developed an assignment for pupils about the Waddenzee (see map, Figure 16.3), as presented in Figure 16.4.

Figure 16.3 Sketch map of the Waddenzee

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Do the Netherlands have to reclaim the Waddenzee in order to obtain more land for settlement, recreation and work?

Imagine the appointment of a new Minister for Transport and Waterworks. This Minister puts forwards the following idea to solve the land problem in the Netherlands. He proposes to reclaim the whole of the Waddenzee. This will create enough land for people to live in, for recreation and for work. It will then become much easier to prospect for oil and gas, because our present supplies are running out. Nature areas can be included in the plan for birds and other animals to live in. In addition, the implementation of the plan will generate a lot of employment, which is good at a time of high unemployment. It is a disadvantage for the fish and other animals in the Waddenzee, but they will undoubtedly find another place to live. But, mankind is nature's master, is it not?

Form a group with three fellow pupils. As a group you will have to make a decision on the reclamation of the Waddenzee. During the group discussion you are allowed to use the set of steps below. It may be useful to make notes for use in the discussion later on. You will have 15 minutes to achieve a consensus as a group. If it appears to be impossible to achieve a common point of view, do not worry. When the 15 minutes are over, we will exchange our various points of view.

Step 1 What is the problem?
The Netherlands are slowly getting overpopulated. It is possible to enlarge our country by reclaiming the whole of the Waddenzee.

Step 2 Who is involved?
You have to come up with at least two groups directly involved in this problem.

Step 3 What are the decisions of the groups involved?
Which of the two groups will be in favour of the reclamation and which will be against? It is possible that one of the groups has not come to a decision.

Step 4 What reasons do the groups involved have for their decisions?
For each group mentioned in steps 2 and 3, you have to look for a number of reasons for and against the reclamation of the Waddenzee.

Step 5 What is your decision?
Was it possible for your group to achieve a common decision? What is the group's point of view? What are your reasons for this point of view? If it has not been possible to achieve a common point of view, explain why you could not come to an agreement.

Figure 16.4 Example of an assignment based on the set of steps for geography.

16.3.2 The discussion

The instruction presented above formed the starting point for a discussion between geography teachers on the functioning of the set of steps in the classroom. The main points of discussion were (1) the claimed usefulness of the problem as an object for decision making, (2) the prior knowledge required, (3) the difference between argumentation and decision making and (4) the functioning of the set of steps.

16.3.2.1 The problem

Are pupils able to make a decision about any (geographical) problem? Or only about familiar problems, for example problems in their own environment? The teachers involved in this research differed on this matter.

> *(teacher A) Geography includes the whole earth. Why do pupils have to make decisions about the conflict between two groups in the Kalahari? The nearer the problem, the more important it is to make decisions. The first four steps in the set are important, but the last step gets more important as the distance grows less. Nearer home one can play down the rational arguments with one's feelings. Of course, everybody has a subjective perception of reality, but I believe the perception of an issue in the Netherlands is closer to reality (although that perception will contain some incorrect elements) than the perception of problems in China or Japan.*

> *(teacher B) How many pupils do have an idea of the problems in the Netherlands? In that case also your starting point is zero. It is the same with an issue abroad. I don't think the perception of an issue in the Netherlands is nearer to reality. I think pupils do have a better idea of the situation in Burundi Rwanda than of many problems in their own country.*

16.3.2.2 Prior knowledge

On what kind of information do pupils take decisions? To what extent does the teacher influence the pupil towards some decisions by selecting the information for pupils? To what extent is the teacher conscious of that influence?

> *(teacher A) In this assignment the situation is exaggerated. Another possibility is to start more neutrally. Your presumption is that pupils will opt for the environment. Afterwards you give them information about economic motives. Is that not dangerous? What effects do you want to achieve? Is your objective that pupils will choose the "correct side" even more frequently?*

> *(teacher C) I want to achieve a situation where pupils have a basis upon which they will be able to make a decision. They have to be aware of other interests in this area as well. I want them to discuss that together. I want to broaden their judgment about this kind of issue. I want to create an either, or feeling. The seals are so sweet, but there are economic interests also.*

(teacher A) My problem is that teachers think that only facts are involved, instead of perceptions. Decision making is always subjective. In your role as a teacher you give information, and that information will influence the decision of the junior secondary pupil. In that way it is possible to achieve a decision with the pupils. Because of your own opinion you put the pupils on the spot. For example, a pupil tending to a compromise will answer your question about the Waddenzee with: 'we can reclaim half of it'. When you say: 'water and nature are very precious', that pupil will probably answer: 'well, we'll reclaim one third, and leave two thirds alone'. So in this situation, what is the sense of just asking: 'what do you think about it'?

These quotations reveal the importance of a very carefully choice of the problem-object. The information which pupils have about the problem involved does play an important role. Geographical proximity is no guarantee at all for knowing about the problems. Besides, it is important that teachers and pupils are also conscious of the fact that information about a problem is always limited and that the facts of today can tomorrow become totally different.

16.3.2.3 Decision making or argument

In the set of steps the teachers noticed a gap between the first four steps and the fifth and last step. The first four steps focus above all on analyzing the problem and on the decision making of a number of groups involved. The issue for the pupils is one of arguing: do the groups involved make a decision on the basis of arguments? Does their point of view result logically from those arguments? The fifth step focuses on individual decision making, without any support for this process from the set of steps.

(teacher D) The gap between steps 4 and 5 is a very major one. The first four steps concern analyzing the problem: what are the reasons for the problem, what decision did the groups involved take? To me, the steps after 4 and before 5 would in any case be: what arguments can you think of in favour or against? How do you weigh those arguments in relation to each other?

(teacher E) With steps 1 to 4, the individual's position is not the issue. Perhaps it is the basis for a standpoint of your own. But the real issue in those steps is how others have arrived at their individual positions.

(teacher A) The set of steps leads to a certain focus, the notion that this is how one make a decision. But it also conveys the idea that decision making is something rational. To me, feelings are also involved. I miss that element altogether in these exercises. Verbalization does not automatically lead to a better decision.

(teacher B) To me decision making is not by definition identical to the teaching of argument, because the referential context in decision making is totally different. Somebody whose father works with Shell will have a different view of gas exploration in the Waddenzee from that of a supporter of an ecological pressure group. You can arrive at a decision based on feelings, but also one based on a weighing up of the arguments.

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When comparing the geography set of steps with the normative model (Figure 16.1), it becomes apparent that the set does not have an explicit moment devoted to criteria development. And, in addition to content criteria, this set also lacks the possibility to develop criteria having to do with personal values. Personal values can represent the various feelings people have towards a problem in need of resolution.

16.3.2.4 Functioning of the set of steps

All the teachers involved agreed that the first four steps of the set may be of value in helping pupils structure their analyses of how certain groups may arrive at a decision. But about the role they play in the decision making of the pupils themselves, the views are divided. Some teachers see structuring the lesson preparations and the group discussions as an important function of the set of steps.

> *(teacher B) I am much more in favour of putting a problem to these pupils and asking them 'what is your decision on this', and then ask them 'how have you come to this decision?' As far as I am concerned they can use whatever structuring they want.*
>
> *(teacher C) The set of steps does force the pupils to try to understand the decisions reached by others.*
>
> *(teacher B) I cannot live with that last step. Argumentation theory is something you can put to the test, if you give sound content arguments and in the end succeed in formulating these correctly into an decision. With decision making that is not possible. You cannot say to somebody whose religion tells him to be against abortion: "Yes, well. I'm sorry, but I consider that bad argumentation". It is not so much such a set of steps and arguing or discussing that I am against, but that in decision making other aspects also play a role, and pupils should have room for that. I consider a set of steps too structured for that purpose.*
>
> *(teacher C) Before, I never consciously worked on decision making in the classroom. But now that I have some kind of structure in the shape of this set of steps, I do consider it important. Earlier I did pay attention to it, but not so consciously. Perhaps the set of steps has been important in raising my own awareness.*

16.3.3 Conclusion

Decision making is a component of the geography curriculum in the first (junior) phase of secondary education and will be a part of the future second (senior) phase. This preliminary exploration has shown that the teachers involved all consider it important to stimulate the decision making process with pupils. The set of steps is seen as a valuable instrument to have pupils analyze how different interest groups may view a (geographical) problem.

Besides, some teachers see the set of steps as a valuable instrument to structure their lessons and group discussions. There are doubts as to whether it is desirable or not to have pupils work on their own decision making using a structured set of steps. Next, the absence of sufficient room for pupils to verbalize values important to them individually is seen as a shortcoming.
Using the normative model (Fig. 16.1) would probably meet this last objection. In developing criteria, personal values play an important role.
It is recommended that assignments are structured along the lines of this normative model. In this way, pupils may arrive at a decision in a structured manner, at the same time providing room for the pupil's personal values (and feelings). Parallel to this, the normative model can be used to have those pupils who have taken a more personal route to come to a decision and to look back over their decision making process.
Experience with these assignments, which are still very much in the design phase, will be subject of further research.

16.4 Student material

As a geography teacher, one can set oneself various goals when working on decision making in the classroom. Possible goals are:

a pupils learn to make a distinction between facts and opinions;
b pupils learn to identify themselves with the points of view of various interest-groups involved in a geographical issue;
c pupils learn to come to individual decisions on a geographical issue; they learn to verbalize that decision and to support it with arguments.

In the above text, it has become apparent that a number of Dutch geography teachers consider the set of steps in Figure 16.2 to be an appropriate means to structure pupil assignments for the second goal. In addition, it has been suggested that the normative model in Figure 16.1 should be used to design assignments focused on the third goal.

Instruction

- Design a pupil assignment to try to achieve the second goal mentioned above. To structure the assignment, use the set of steps presented in Figure 16.2. If possible, choose a geographical issue familiar to the pupils.
- Design a pupil assignment to help to achieve the third goal mentioned above. To structure the assignment, you could use the normative model presented in Figure 16.1. In any case, you should use the normative model as a checklist to avoid forgetting important aspects of the problem.

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17 NOT A WASTE OF EFFORT

David Cooper and Chris Coggins

17.1 Introduction

Despite the growth of environmental teaching in geography, waste and particularly solid waste management is a neglected area. This exercise which is intended to be used in parts as well as a whole, sets out to remedy this by encouraging students to research and present case studies for a local and regional waste management proposal. It is hoped that teachers will use the worked example as a basis for more specific studies related to their own area.

17.2 Aims and Objectives

Aim

To increase students' awareness of the interactive nature of problems in social and economic geography with the environment and its management.

Objectives

1 To define and quantify solid waste from domestic, commercial and industrial sources.
2 To locate these sources geographically and to consider the implication of this for the disposal of these wastes.
3 To examine the location of disposal sites and evaluate alternative methods of disposal.
4 To examine and evaluate attitudes to waste disposal from the environmentalist and public stand points.
5 To present appraisals and to approach conclusions based upon the above.

17.3 Methods

The scene is a fictional English example but is capable of transposition to most urban and many rural locations in the developed world and to urban locations in most other countries. The quantities of waste and its composition may change. The ultimate destination may be influenced by legislation disfavouring lower cost landfill and encouraging the use of higher cost methods such as incineration. The exercise attempts to realistically evaluate the choices open to the various organisations involved with waste management and the opportunities which the public and the environmentalists in particular have to influence the ultimate selection

The example concentrates upon the disposal site and the disposal methods employed. Before waste can be disposed of it has to be collected and transported the economics of these influence the final stages.

Simplistically the more sophisticated the disposal techniques the larger and therefore geographically wider the waste sources need to be. The waste supply needs to be adequate to justify investment and to maintain the processing at an economic level.

17.3.1 Scenario (a) Fictional

Squareland Waste Limited is a consortium of local government agencies and private waste management companies serving Squareville, a city of 480,000 population, two satellite towns of 60,000 and 40,000 respectively and a rural and small town population of 15,000. This generates from 200,000 households 11 kg domestic refuse weekly per bin collected, 2,200 tonnes in all, to which is added a similar total of commercial and industrial wastes. Approximately, 1,000 tonnes of special wastes are disposed of annually. In addition the local regional hospital and a national veterinary hospital generate clinical wastes. Inert building wastes and wastes containing small amounts of putrescible materials amount to 75,000 tonnes per annum. The existing landfill disposal sites for Squareville and district are coming to the end of their void space. Squareland Waste Ltd have identified a new site 32 kilometres northeast of the city but in the adjacent administrative area, Harbourland. The site of 600 hectares is a former clay quarry associated with the ceramic and pottery industry. This had a capacity to receive 12.5 million cubic metres of waste, 10.0 million tonnes during the lifetime of the site. If Squareland alone used the site it would last for approximately 30 years at present rates of deposition.

Within Squareland Waste Ltd there has been a debate between local government agencies and the private waste management companies, one of whom owns the potential site. The agencies reflecting the views of their members who are the local government electees believe the new site should have an incinerator with electricity generation and heat recovery as the main means of disposal. They believe this is a more environmentally friendly method of disposal, giving greater possibility of materials recovery from the waste stream as well as prolonging the life of the site by up to 20 years.

The private companies would prefer a landfill operation, the capital cost would be substantially less, methane gas would be recovered for electricity generation, leachate control measures would be similar for either disposal system.

Successful economic operation of either disposal system would depend upon attracting wastes, especially putrescible and certain types of special wastes from Harbourland or other areas. The incinerator proposal has support from regional water companies who require sewage sludge disposal facilities.

Squareland Waste Limited has made a proposal to develop the site, with incinerator. The proposal has to be considered by Harbourland Council as the planning authority. Their role is to consider the proposal in the context of land use both existing and future, adjacent land uses and the interests of the local populations. The Regional Legislature Environmental Department has 'called in' the plan because it involves two Councils and affects the interests of other waste disposers. This body will hold a public inquiry of one is considered necessary. The National Environment Agency also received the proposal. This body is responsible for

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licensing the site as having a safe method of waste disposal, that will not pollute water supplies not cause air pollution by emissions or leakages. These three bodies are compiling their considered professional responses to the proposal.
Local environmentalists and communities who consider themselves affected by the proposal are making their response. The environmentalists are divided. Some favour the incinerator as being the best practical environmental option (BPEO). Within that group some think that the Squareland Waste Ltd proposal is not the best available technology not entailing excessive cost (BATNEEC) and want the proposal revised. Some prefer the landfill proposal considering the site will be 'restored' more rapidly and that more area will be available for tree planting and recreational grassland. Within the local communities a village of 1500 population where the ceramics works still operates employing 250 is against the proposal on noise, smell and emissions grounds. This is regarded by the Company as a "not in my back yard" (NIMBY) attitude. Another village, approximately five kilometres away beyond a ridge do not want the site at all, their view is interpreted as 'build absolutely nothing anywhere near anyone (BANANA).

17.3.2 Scenario (b) Factual

The scenario is capable of local adaptation. The tonnage of waste can be adjusted to fit local outputs and inputs. The transport of waste has been deliberately left open. Transport from major urban areas is usually by bulk carriers from transfer stations rather than by the collection vehicle. The bulk carrier is frequently a road vehicle carrying waste with a built density of 0.6 tonnes per cubic metre. Rail transport may become economic over distances of 100 kilometres or more, especially if the density can be increased. Water transport requires a suitable waterway but typically can carry six to ten road vehicle loads per barge.
The site costs are somewhat simplified by one of the proposing company components owning the site. How the development costs are shared is not considered. Development as a landfill could be expressed as a start-up cost of £1.5 million including installation of electricity generating capacity plus a disposal cost of £10 per tonne which will include gas recovery, leachate control and final restoration costs. Incineration capital costs are much higher, £25 million with an annual maintenance cost of £2 million. Incinerated ash and dusts require landfilling and, whilst approximately a quarter to a third by volume that of landfilling the same waste, may cost as much or more per tonne, £10 - £12.
Successful economic operation of incinerators also requires a constant flow of material at a rate which justifies the level of investment in the plant capacity. Typically large incinerators burn 8-10 tonnes per hour, an annual capacity of about 80,000 tonnes. At present in Britain incinerators serve populations ranging from 125,000 upwards but the more thermally efficient with electricity generation and local heating schemes serve, populations of 300,000 or more. The 'gate fee' price for a load at the incinerator may vary between that for a 'participating authority or agent' and a load being delivered by an occasional user. Cairncross (1993) quoted Britain as costing £30 per tonne incinerated and £12.5 per tonne landfilled as comparative costs.

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The example may be applied to many regions in the developed world and to urban areas elsewhere. In Europe and North America provincial, regional and district authorities maintain collections of waste statistics. It is the authors' experience that the officers responsible for these welcome interest in their work. Where collection, transport and disposal of wastes are in the hands of private operators the officials are frequently the best sources of contact with the companies. Again experience has shown that these are usually pleased to show how they work as the public at large is often ignorant of them. At the school level where recycling programmes are run both by authorities and by companies the recycling officer or the education liaison person is a useful introduction to waste management procedures and practices.

17.4 Teaching Approach

The approach is designed to be flexible to allow both for differences in class size and stage of student development. The larger the class the more aspects of the problem which may be treated. The further the student development has progressed the deeper the research and broader the background reading which can be expected. The topic is introduced by a background lecture session which establishes the principal characteristics of the problem and sets out the scenario, fictional or actual. There are advantages to using an actual example, data sources are fairly readily accessible in national and regional environmental statistic and in professional journals. Geographical journal data sources are many fewer.

To meet objectives 4 and 5 students should have opportunity to debate and discuss their findings in order to develop a balanced, rounded view of the waste problem. Media pressures frequently present case studies as "bad" or "good". In the language of waste management, resource recovery and recycling, incineration or landfill BATNEEC has an important place. It is easy to meet and to solve BPEO challenges if money is "no object". It is hoped that this approach will encourage students to be aware of the magnitude of a problem which is their everyday concern, to be understanding of the technically feasible solutions that are available and those which as members of society are financially acceptable by them.

Students work in teams. There is a three fold division initially, the Company, the Regulatory Authorities, and the Environmentalist and Community Representatives. Each of these prepare and submit their cases. Where there is a really small class the company may submit its proposal to the authorities who develop their response taking into account the environmentalists' viewpoints. If there is a large group then the possibilities become broader. The cases for both landfill and incinerator developments can be prepared by the proposers - they can develop their costings, site life expectancy, transport methodology and their operating methods. Degree level students could be expected to make comparisons within these headings. The regulators would need to work in parallel with the company representatives rather than follow them as in reality but given the alternative technologies available can build scenarios with which to challenge the similarly the local community representatives and the environmentalists can develop their cases. They probably need reminding that theirs are not simply NIMBY or BANANA solutions but require considered and well understood content to stand up to challenge and question.

Presentation may take a number of forms. At the most simple, the representatives of each major division could put their case to the course teaching staff and defend on their view point. This could be developed better into the major divisions presenting their cases to an assessor who can both permit questions between the groups following presentation and to formulate questions on aspects either poorly covered or apparently misunderstood. If time allows the presentation could evolve into a full scale public inquiry with 'lead experts' appearing for each element, supported by teams of 'researchers'. To achieve maximum effect this requires to be done within a limited time period - not allowed to spread across one teaching period in several successive weeks. Consequently presentations or submissions need to be limited to 10 - 15 minutes each. Individual student contributions probably need to have a minimum of five minutes however painful they may be to listen to. Presenters should be allowed access to overhead projection facilities, slides and limited photocopying for distribution (Jenkins 1992) Each student makes a written, illustrated submission on his or her aspect of the study. This has two purposes, it provides an alternative assessment from the presentation and ensures that 'backsliders' can be identified from their paucity of their efforts and conversely.

Although the teaching method utilises the student presentation, the balance of marking should favour the written submission.

The assessment breakdown may allow a component for the approach to the presentation, dress, audibility, use of visual aids, interaction with other members of the team and the audience, as well as the component for its content and relevance which is already taken care of in the written submission. Quality and organisation of illustration, use of supportive and critical materials should contribute to the score there in. This approach to assessment may reflect an increasing concern that geography has to teach transferable skills, as well as the content based learning.

17.5 Materials

A Maps

For a 'real-life' location extracts of a 1:10,000 scale map are required to show the site selected for development. This will probably require outlining and copies of this map should be available for each group to work with. This is not a scale usually encountered in secondary teaching so a little familiarisation time may be required.

A 1:25,000 or 1:50,000 scale map is required for the site location. This is important to identify access roads (rail and water links if possibly used), the location of affected settlements, possible areas affected by noise, dust and odours and water-courses possibly polluted. Thirdly a 1:250,000 catchment area map is needed to show the whole area affected by the scheme.

B Other materials

If a real site is chosen a vertical aerial photograph can highlight landuses not easily discovered from a topographical map, similarly a geological map is a useful data source. Again with these students may require guidance to take them beyond initial unfamiliarity, especially if the geology map shows bed thickness, dips and faults.

Waste data has a reputation for being unreliable. Local waste authorities may be able to offer some hard data but do not be surprised if costs are quoted in round terms even if charges are precise. Beware of mixed units, volumes and weights quite often interchange. Students may need to be reminded of the meaning of density. Waste also has its own vocabulary - in English the source material is described as 'waste arisings'. Waste is disposed of not dumped.
The exercise will also need transport costs, and may need collection costs to be a totally realistic example. Railway costs possibly like others may be confidential and best guess may have to suffice.
Presentation materials and facilities are also needed. Students should be deterred from too heavy reliance on photocopies converted to overhead projector transparencies. How much is provided or the students provide may vary with circumstances.

17.6 Conclusion

The intention is to encourage the teacher to use one of the less popular aspects of geography - waste to develop an exercise which brings together a number of 'hot-topics' of economic, social and environmental geography. Whilst this example is concerned with the 'pros and cons' of a waste disposal facility the materials collected and researched for this could also provide for teaching transport geography, surface and ground water hydrology, the national, regional and local planning hierarchy and its impacts, demography population size and structure.
There is no intention to be prescriptive but to encourage you to go where few have gone before even to enjoy the smells and sights of waste management.

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Additional note

In the context of Western Europe, North America, Australia and Japan the quantities of waste generated are proportionally reasonable. In applying the example to their own area it is recommended teachers seek local data. In this respect publicity materials produced by local authorities, regional provincial and national governments and by the waste management industry are especially useful.

SECTION D

INTERNATIONAL COOPERATION

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INTERNATIONAL COOPERATION: INTRODUCTION

Joop van der Schee

Building on earlier publications, the contributions of Haubrich and Convey in this chapter offer theoretical and practical information concerning the promotion of international understanding and cooperation through geography teaching. Both articles contain useful information for geography teachers and students in teacher training colleges.

In chapter 18 Convey describes the perspectives for achieving a European dimension in the training of teachers. Although there is a great deal of criticism concerning moves towards further European union and although there is no specific theory about the content of the European dimension in education, geography teachers are expected to teach on more than the national level alone and to give full attention to such issues as comparative location, tolerance and nationalism. Focusing on these broad concepts Convey summarises how students might approach the building of a European dimension in their teaching of geography. A set of questions is presented which might be regarded as a quality checklist for student's European credentials in the teaching of geography. Teaching about the geography of Europe is quite a normal thing to do in geography lessons and more and more important as economic interaction increases. However Convey makes a plea for going further than knowledge of facts and figures by giving attention to concepts that are connected with international understanding and cooperation.

Stereotypes hamper international understanding and cooperation. According to Haubrich, international understanding and cooperation seem to improve by an exchange of information and ideas. Geographical education can play a vital role here. Geographical knowledge of peoples and places is supposed to be fruitful in showing that there are many similarities between people and between places as well as differences. Although research results about the impact of geographical knowledge on international understanding and cooperation are missing, the general idea is that an increase in knowledge about other people and places will weaken stereotypes.
A theoretical model for cognitive representations and behaviour developed by Gold can be useful in making students in teacher training courses aware of the processes which influence our image of people and places. Haubrich focuses in chapter 19 on five methods for teaching international understanding and cooperation. Teacher proof student materials and statements for discussion are added. The presented methods of image analysis, rating scales, making preference sorting diagrams and identity analysis are well known from earlier publications. The last method of content analysis is perhaps the most fascinating for geography students because it confronts the user with the images of students in other countries of the world. A checklist for content analysis is added. Haubrich suggests that it is worthwhile for geography classes in partner schools all over the world to exchange essays on foreign and self perceptions. Modern technology now facilitates these excercises in international cooperation and understanding.

The contributions of Haubrich and Convey both stress the training in reflection on international relations by geography teaching. The importance of geography to international understanding was emphasized by Johnston (1990):

> *"The value of geography will be demonstrated by the educational rather than the technical content of geography, by its development as a means, first, of promoting self- and mutual understanding and thereby reducing conflict potential, and second, of emancipating people, of bringing them to an understanding of how their world works".*

Reference

JOHNSTON, R. J. (1990), The challenge for regional geography. Some frontiers for research frontiers. In: R.J. Johnston, ed., Regional Geography. London: Routledge, pp. 122-139.

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18 ACHIEVING A EUROPEAN DIMENSION IN THE TRAINING OF GEOGRAPHY TEACHERS: REVIEW AND FUTURE PERSPECTIVE

Andrew Convey

18.1 Introduction

In the recent past, when one was discussing the issues raised by this subject, across Europe one was normally considering them in an atmosphere which was almost wholly positive and constructive. The Commission of the European Communities (1988), the Council of Europe (1991) and member governments (DES 1992) had issued publications showing how we might develop a European Dimension to our teaching and geography teachers in large numbers had responded with enthusiasm (Convey & Speak 1994). At the present time however, while the same teachers may well retain that enthusiasm, they are assailed across Europe by a great deal more negative criticism concerning moves towards further European union, this being more marked in some member states than in others. At the same time, students in higher education and their tutors are listening to all of this well publicised arguing and are very closely influenced by it. It is not uncommon, for a tutor to be attempting to develop a European Dimension to his or her teaching, while being surrounded by negative and sometimes hostile public media and political comment about the same field. In the Education business in general, one has learned that whatever happens at the public and political level from time to time, the broad, underlying recent trend in European Education has been one of closer contact between the countries of Europe. We also know that in addition to the fact that the publicity given to the European debate influences our students in a very direct way, those same students are travelling more widely and in much larger numbers, perhaps via the ERASMUS (now SOCRATES) and other programmes, and of course family holidays. The clear professional consequence of this is that we have to do what is necessary to prepare our geography teachers, and they in turn their pupils, for the European and wider world in which they are going to have to live and work, and it is possible to argue that it would be a considerable dereliction of professional duty if we did not attempt to do this. It is argued by some, including this writer, that student teachers in training and also their tutors, may be identified as a crucial group of professionals where the treatment of the European Dimension is concerned. How therefore should the current challenge by met in the training of these geography teachers?

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18.2 Background and theory

18.2.1 Background

That geography teaching should have a European Dimension is by no means a new argument. At the end of World War I, when looking to the future, Fleure could argue in his new book:

> *"(this) is not intended to be a textbook of geography, it is rather an effort towards a closer contact with the ever-flowing stream of experience which has made of us, in the present competitive, in a better future more co-operative, groups that might work side by side for the enrichment of the life of humanity" (Fleure 1919).*

and at the end of the second war, despite remaining somewhat reluctant in tone, Fitzgerald could state:

> *"More than any other great power, because of the extreme sensitiveness of her industry and commerce to the condition of international relations, Britain, in her own interest if for no higher motive, should strive for a new order, and particularly for a federated Europe" (Fitzgerald 1946).*

Geographical studies of Europe "as a whole", as opposed to the traditional study of individual European countries, received a strong impetus in the years after the signing of the Treaty of Rome (1957), and found expression in courses of "European Studies", such as those which were developed in the UK in the 1970s and 1980s (Williams 1977). However, the period since 1986 has seen the most significant developments. Things began to change with the 1988 Resolution from the European Communities, followed by the set of Conclusions from the same Ministers, which outlined more details about possible avenues of approach to the European Dimension in Education and Training "in the run-up to 1993", and not least where this applied to the training of teachers (Commission of the European Communities 1988; 1989). In 1992, a "Memorandum on Higher Education in the European Community" once again stressed the important role to be played by teachers, making the points that,

> *"it is essential that a European experience should form part of the professional education of all teachers", and that, "a means of providing European experience for teachers who cannot avail themselves of a study period abroad should be developed" (Commission of the European Communities 1992).*

While respecting national autonomy through the concept of "subsidiarity", the Maastricht Treaty (1992) enhanced these trends. One of the benefits of the treaty so far as Education is concerned, which did not receive any publicity during the prolonged debates about ratification, is that it will for the first time place the whole Education spectrum within the competence of European Community programmes (subject of course to the "subsidiarity" principle), (European Parliament 1992). Up to now, the only programmes available have normally applied to higher education, including teacher training. Schools had been excluded, a result of the policies of certain national governments. With the ratification of the Maastricht Treaty

however, the new COMENIUS section of the SOCRATES programme has been developed, which will provide for a much increased participation from the school sector.

18.2.2 Theoretical considerations

It has already been pointed out by Williams (1992) that unfortunately there is so far very little in the way of empirical data to demonstrate how the European Dimension is being defined by teachers and teachers trainers, though some attempts have been made (NCC 1990). What pupils are learning in those classrooms where geography has deliberately been given a European Dimension is a crucial concern if progress is to be made in this field. It would be idle to pretend that a specific theory of "the European Dimension in Education" has been clearly formulated. What is true however, is that lying behind this concept are a number of ideas, very important to the teacher, which are well founded in political, social and educational theory. These will include *Comparative Location, Political Awareness, Citizenship, Cultural Awareness, Perception, Tolerance, Prejudice* and *Nationalism* (see section 18.4 on "student materials"). With respect to educational theory and practice and the European Dimension, an important issue will be to explore *"the nature of a community"*, whether at family, school, local, national, European or global levels.
An understanding of the cross-curricular area of Citizenship is central to the European Dimension, and therefore the question of *"roles, rights and duties in democratic societies"* is dominant (NCC 1990). And there remains of course the highly-charged field of *Attitudes, Moral Codes* and *Values*, where geography teachers frequently find themselves involved and where many fierce debates continue to take place. To what extent, for example, should pupils be encouraged to think independently on social and moral issues and to have an active concern for human rights? And/or to what extent do teachers have a real role in counteracting the nationalistic *"my country right or wrong"* tendency? Because of the nature of their subject, geography teachers are embroiled in these arguments, whether they like it or not! (Council of Europe 1985, 1991)

18.3 Methods

It is therefore of some importance to consider how the situations considered in section 2 (above) might be handled when training geography teachers. There are European, institutional and classroom considerations here. Reference has already been made to the existence of the newer European programmes which favour the school sector and teacher training (notably SOCRATES/COMENIUS), though this is not the place to describe these in detail. But there are key issues to consider across Europe in the training of geography teachers, and some of these were well summarised by the Dutch Minister of Education (Ritzen 1991). Adapted to the specific context of geography these could read as

- the promotion of greater international mobility for geography teacher trainees,

- a lower degree of specialisation in geography teaching, allowing more time for considering issues such as those raised in section 2 (above),
- the fruits of research should be consistently available to geography teachers from the moment that the teacher first stands in front of the class,
- individual countries might give higher priority to internationalising elements in the geography training curriculum, utilising good practice from all systems.

These and other aims remain as desirable goals for geography teacher trainers across Europe, and are being actively pursued by geographers in the Association for Teacher Education in Europe (ATEE) and in the European Standing Conference of geography Teachers Associations (ESCGTA), now EUROGEO. Back at the training institution, whether university, college or institute, a number of challenges are being faced in achieving a European Dimension to training courses. A pilot study undertaken in the UK in 1992, put forward a checklist of guiding principles:

- CO-ORDINATION: the implementation of a European Dimension across the wide variety of components which make up the institution and its activities.
- IMPLEMENTATION: a "core team" of staff, including management, to implement the means by which tutors may incorporate the Dimension into their activities.
- SPECIFIC FOCUSED COURSE INPUTS (eg. in geography), accompanied by PERMEATION and/or OPTIONAL COURSES.
- LONG TERM AIMS for implementation (eg. a 3 or 5 year plan), accompanied by shorter term OBJECTIVES which relate to more specific action.
- MAKE AUDIT OF CONTACTS with counterparts in the rest of Europe, to maximise opportunities.
- MAKE AUDITS OF LANGUAGE COMPETENCE amongst all colleagues and arrange appropriate language training.
- JOINT RESEARCH and CURRICULUM DEVELOPMENT to be developed with colleagues in other parts of Europe.
- COLLABORATION WITH SCHOOLS to be developed in other parts of Europe, to develop curricula and materials (Welch & Porter 1992).

While an institution's teacher trainees would undoubtedly benefit from the above, tutors will also benefit by having some evidence of their students attitudes towards the European question, as this knowledge may be used to colour the way in which the institutions courses are run. A 1988 research project based upon all the UK training institutes concluded that such attitudes ranged widely, from,

> *"our students rarely have parochial attitudes; most have travelled widely and regard themselves as Europeans",*
> to
> *"we do not try to promote Europe; we are not training young Europeans".*
> *(Convey 1988)*

More recent and detailed research with students of similar age, which is still being pursued, has perhaps suggested that a "European identity" does not yet figure very highly in their minds, which presents further challenges for their tutors (Haubrich 1994).
But the teacher trainees themselves need to be encouraged to develop a point of view on the question of a European Dimension to their work. While the gaining of a factual and knowledge base is clearly important, it has been suggested earlier in this chapter (p. 213) that broader concepts are more significant. Section 18.4 which follows therefore summarises how students might approach the building up of a European Dimension in their teaching of geography based upon these concepts. It might be regarded as a quality checklist of a student's European credentials in the teaching of geography!

18.4 Student material

18.4.1 Comparative location

A country's location in Europe may substantially affect the way "Europe" is seen. The views of students in Greece, Ireland & Finland, for example, are likely to vary greatly.

Questions

- *do I try to present the current truth about other European countries, or am I over-reliant on second-hand sources, which might be out-dated?*
- *do I over or under-estimate the differences between different European countries?*
- *how does my country's location in Europe affect my choice of material on Europe as a whole?*

18.4.2 Political awareness

Most geography students will be aware that the "European Dimension in Education" is a highly politicised matter.

Questions

- *am I reasonably well informed of the political statements on "Europe" coming from my country's government; other European governments; the European Commission; the Council of Europe?*
- *how do I find myself responding to the "tone" of these statements?*
- *how would I set about auditing my pupils' reactions to these statements?*

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18.4.3 Citizenship

This may be one of the more important concepts covered by the European Dimension, having a close relationship with geography.

Questions

- *how do I relate the question of the role, rights and duties of a "citizen" to my understanding of geography?*
- *what are there substantive differences between being a citizen at national and at European level?*
- *how would the idea of "open frontiers" in Europe affect the structure of my geography teaching?*

18.4.4 Cultural awareness

Cultures, languages and traditions vary enormously across Europe. In fact, Europe as a whole may be regarded as a multi-cultural society writ large?

Questions

- *am I able to draw any assistance from geography & multi-cultural education "at home", for teaching about multi-cultural Europe?*
- *by co-operating with my language teacher colleagues, am I able to make use of geography teaching materials in other European languages?*
- *a class and or school audit of pupils teachers from, or having close connections with, other European countries will provide me with useful first-hand teaching materials?*

18.4.5 Perception

This may be regarded as one of the geography teacher's main faculties - if he/she gets it right! If inaccurate perceptions about a country and/or its people are passed on to pupils, those may last for another half century at least.

Questions

- *have I tested my own perceptions against the best current geographical information I can get?*
- *do I try to ensure that my classroom explanations of other European countries and or people are objective (eg. no jokes which might harm)?*
- *so far as is possible, have I conducted an audit of pupils' existing perceptions before I start to teach them - and perhaps afterwards too?*

18.4.6 Tolerance, prejudice, nationalism

These related concepts are perhaps the most crucial in Europe at the present time. Prejudice and nationalism are widespread, perhaps an inevitable response as union gets closer? The need for a widespread growth of tolerance could not be more pressing.

Questions

- *how do I convince pupils with prejudices about another European country that my objectively-based teaching is correct?*
- *are nationalism and the European Dimension anathema to each other?*
- *how may my teaching of geography help to increase levels of tolerance amongst my pupils?*

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19 INTERNATIONAL UNDERSTANDING AND COOPERATION THROUGH GEOGRAPHICAL EDUCATION

How we see People and Places

Hartwig Haubrich

"Why can't they be like us?
(Unknown foreigner / 20th century)

19.1 Introduction

They may be few, but there are some people in the world who try to avoid stereotypical perceptions of their own and other nations. They know that clichés and stereotypes create the worst possible conditions for the promotion of international understanding and cooperation. Such people look for objective and empathetic images of people and places in the world. Friedrich Schiller, a German writer of the 19th century, is an example of this kind of cultured person. He wrote: "I write as a citizen of the world who serves no prince. At an earlier age, I lost my fatherland to trade it for the whole world".
Our images of the world are always models. They can never convey the whole truth. They are determined by historical and geographical contents as well as the interests, values and knowledge of individuals. The more true images they contain, the more they approach objectivity. The fewer true images they contain, the more they become clichés and stereotypes. The following examples illustrate the difficulties and pitfalls of writers perceiving themselves and others.

Karl Friedrich Moser wrote in the 18th century that:

> *"Every nation has its principal motive. In Germany, it is obedience; in England, freedom; in Holland, trade; in France, the honour of the King".*

The author of this chapter wrote in 1984:

> *"What does 'German' mean? Before the Second World War, there was a clear understanding of 'German' as German beer, German wine, German songs, German girls, German forest, made in Germany".*

Since the Second World War the word 'German' has seldom been used by Germans and there has been a danger of loosing national identity.

Recently it seems that many Germans are again discovering their nationality and at the same time dreaming of becoming good Europeans. I do not know whether this is a wish or reality, but I am sure that describing people and places is a dangerous enterprise" (Haubrich 1984). The surface meanings of images, clichés and stereotypes are changing all the time, but many also have a long-lasting quite stable core which has an impact on international understanding and cooperation. Therefore it is necessary to know how images are built and how images influence actions.

19.2 Theories on spatial perception and behaviour

It is common sense that one of the main goals of Geography and Geographical Education is to study human-environment interrelations. The environment is the basis of human spatial cognition, but human abilities and interests influence the perception of spatial information. In this way selective spatial schemata are built, which may influence but do not determine behaviour.
This behaviour changes the environment and therefore the basis of the potential perception, which can, but must not lead to new images, mental maps and other spatial schemata.

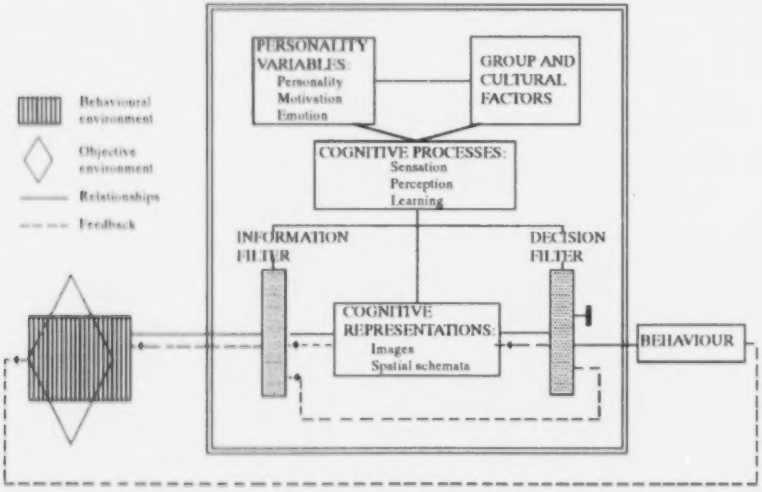

Figure 19.1 Paradigm of spatial cognition and behaviour (Gold 1980)

Figure 19.1 shows a more complex model. Gold's paradigm of spatial cognition and behaviour (1980) describes the interrelations between environment, cognition and behaviour. Cognitive processes are quite complex processes of sensation, perception and learning. Although the psychological and pedagogical sciences study these processes and have developed many

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insights, a lot of questions remain open and will remain open. We know that variables such as personality, motivation, emotion, culture etc. have an impact on perception but we do not know the intensity of these impacts. A quite complicated system of interrelations and processes leads to cognition, i.e. to the spatial schemata images, stereotypes, clichés, mental maps etc. These representations are not photographic but perceptions in the absence of external stimuli. The objective environment and the perceptional environment, but also the behavioural environment, are not the same thing.

Action space, perception space and the external space of the real world are overlapping but different. There are information filters between cognition and the environment such as schools, parents, friends, journal, TV, trips etc., but there are also personal abilities, values and interests.

Cognition, i.e. the cognitive structure or the coding system but also such the subconscious variables combine to build the basis to actions. But there are decision filters between cognition and behaviour as attitudes and values, which lead to the selection of special actions.

This model is not a deterministic and mechanistic model but it shows many variables, factors, subsystems, interrelations and feedback of quite complex processes of spatial cognition and behaviour.

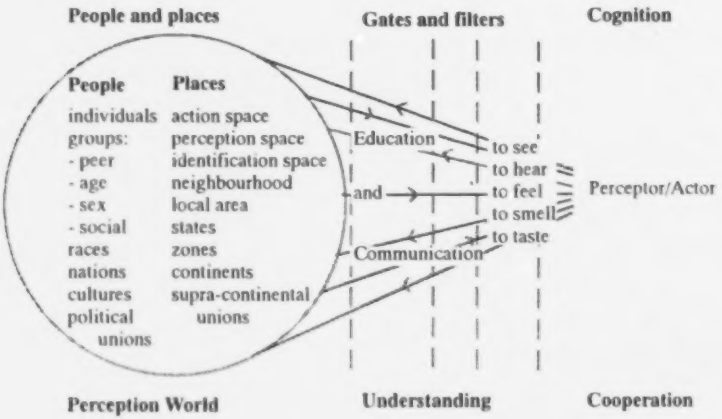

Figure 19.2 *Paradigm of international understanding and cooperation (Haubrich 1984)*

Figure 19.2 shows a paradigm of international understanding and cooperation. International understanding means an understanding of people and places or better, positive attitudes to other people in the world. One essential basis for friendly attitudes is knowledge. But what kind of knowledge? This author's research (Haubrich et al. 1990) has shown no relationship between attitudes and general knowledge. Future research should differentiate between different kinds of knowledge, knowledge of physical geography or of human geography. On the basis of current understanding, it seems that knowledge about people is the main basis for international understanding.

To know the filters and gates which exist between the potential perception world and the perceptor is very important. Geographical Education is just a small gate in this communication process. Of course, Geographical Education has to deliver the right information about people and places, but more important is its contribution to the education of young people so that they can use the information of all gate keepers critically and constructively, as for example the mass media. The cognitive dimension of education has to be broadened by making use of all the human senses in the information and communication process. Although the final behaviour of the perceptor cannot be determined by the selection of the "right information" and by an agreement about "right values", educators can hope that this form of schooling is a good basis for adequate attitudes and behaviour.
It seems more likely that international understanding and cooperation may be improved by practising communication and cooperation through the exchange of information and ideas, through joint meetings, meals and festivals, and ast but not least by practising solidarity with other people in other countries. It can be hoped that these activities will lead to self-reinforcing trends towards international understanding and cooperation.

19.3 Methods of teaching international understanding and cooperation

This section contains the leading objectives, principles and methods for the student material (see section 19.4). Of course it is not necessary to use all these materials. The interests and abilities of the students and the geographical and political situation will determine the selection and use of the ideas to analyse the images, clichés, stereotypes, preferences and mental maps of students and last but not least to look for cross-border communication, cooperation and solidarity.

Association exercise: image analysis of people and places.
The first worksheet (Figure 19.3) contains guidelines for analysing images by free associations. The students are asked to answer without hesitation, those people, attributes, buildings, food, landscapes or problems which come into their mind when they hear the name of a country or region. Such brain storming or association exercises often show the differences between people and places. Much more important to education for international understanding, is to ask for similarities, i.e. what people have in common.
The worksheet may be used in the classroom, so that the students may become aware of their own images, but it may also be used as a questionnaire to analyse the images of other people by persons outside the school.

Rating Exercise: profiling of people and places:
The second worksheet (Figure 19.4) contains a rating scale or semantic differential in order to profile people and places. Students can choose their own or another country in order to describe it with the help of pairs of attributes. Although the selected adjectives have proved to be workable, students may choose others for special purposes if they wish. When students have marked the pairs of attributes, they compare the single outcomes, draw a curve between

the average marks and discuss the image profile. The advantage of this method is that the outcomes may be quantified and clearly compared. There are, of course, many statistical methods for processing the data which cannot be explained in this article. Such rating scales are also good project tools for analysing and presenting the images of different groups outside the school.

Sorting exercise: preference diagram of people and places.
The third worksheet (Figure 19.5) contains a sorting exercise which leads to a preference diagram (Slater 1982) It makes a big difference whether it asks for countries where students prefer to live, to work or to stay for holidays. The outcomes are different and show that preferences and images change according to the function of a country as a place for living, working or taking holidays. It is also important to consider whether one's own country should be included or not. Of course, the list of options can be changed. Sometimes students have no knowledge or image of a country. Additionally the list contains many countries which should not be overlooked. It is important that the students look at first for the country at the highest and the lowest level. The two highest levels show the stars and the two lowest levels contain the outsiders. The results can be used to draw a thematic world map with different preference levels. Of course this exercise is just a starting point for discussion.

Value clarification: identity and attachment analysis.
The fourth worksheet (Figure 19.6) contains a questionnaire which can be used to find out the attachement of people to their nation and region, to other regions and countries of the world and to humankind.
Sometimes older students do not wish to volunteer their own attachments. In which case, the students may be asked: "What do you think that people in your region or country are attached to ..." The same question may then be asked of people outside the school. The home nation normally acts as a kind of anchor for valuing other areas. Therefore it is advisable to take the "own nation" first. Other areas may be changed or reduced according to special interests. The average outcomes build a basis for producing a diagram, for discussing motivations and if necessary solution to the problems.

Content Analysis: international exchange and the analysis of images.
Section 19.4 contains essays about "How 15 years old students see their own and other people" (Figure 19.7 b-e).
The students may first of all read and enjoy the essays. Of course they should discuss students' self-images, their comparisons, their values and attitudes and the features they have selected to describe themselves and others. Section 19.4 also contains a checklist of contents (Figure 19.7a) which can be used for a more sophisticated exercise to quantify the content areas described by the students. It is always interesting to discuss the national identity of the young writers and their sensibility towards describing themselves and others. For improving international understanding, it is recommended that one should look for a partner-school and then exchange similar essays on perceptions of both the home and other countries. Why should it only be adult authors who write textbooks and articles about other countries? Cross-border

communications of the type described can lead to more current, interesting and adequate information. That is a first step towards more understanding and cooperation.

Discussion and Actions: results and consequences of the image analyses.
The students may have discovered friendly and fair images, but also prejudices and stereotypes. The discussion about different outcomes has surely produced some reasons for the different images, attitudes and values. Therefore the final worksheet offers a list of hypotheses or rules (Figure 19.8) which may then be verified or falsified on the basis of the students' experiences. Additionally, there are some hints in how international understanding and solidarity can be improved by international communication and cooperation.

19.4 Student material

METHODS

IMAGE ANALYSIS

Attention! This is a tricky and emotional task!

You can be made aware of your images or even stereotypes of other people by selecting some of the following questions and answering them, without hesitation.

People are as different as you and I

When you hear one of the following words, what comes into your mind?
Europe (Western, Northern, Eastern, Southern, Middle)
France (Germany, United Kingdom, Italy ...)
Russia (Albania, Turkey, Serbia ...)

What people come into your mind?
What attributes?
What buildings?
What food?
What landscapes?
What problems?

People are as similar as you and I

What do you think the following people have in common?

Hungarian and Austrian people?
Greek and Italian people?
Polish and Russian people?
Welsh and Scottish people? etc.

Figure 19.5 Worksheet 1

RATING SCALE

HOW I SEE A COUNTRY

1 Choose your own or another country in order to describe it.
2 Mark every pair of attributes on the scale 1 to 7.
3 Draw a graph curve by combining your marks.

Country	1 2 3 4 5 6 7	is:
Large	_ _ _ _ _ _ _	Small
Dangerous	_ _ _ _ _ _ _	Safe
Open	_ _ _ _ _ _ _	Enclosed
Efficient	_ _ _ _ _ _ _	Inefficient
Quiet	_ _ _ _ _ _ _	Noisy
Ugly	_ _ _ _ _ _ _	Beautiful
Uninteresting	_ _ _ _ _ _ _	Interesting
Easy to reach	_ _ _ _ _ _ _	Not easy to reach
Rich	_ _ _ _ _ _ _	Poor
Fashionable	_ _ _ _ _ _ _	Unfashionable
Dirty	_ _ _ _ _ _ _	Clean
Good for tourist	_ _ _ _ _ _ _	Bad for tourists
Healthy	_ _ _ _ _ _ _	Unhealthy
Commonplace	_ _ _ _ _ _ _	Unusual
Could be altered	_ _ _ _ _ _ _	Cannot be altered
High class	_ _ _ _ _ _ _	Low class
	1 2 3 4 5 6 7	

(If you like, you may change the attribution. This form can also be used as a questionnaire in order to find out the self- and foreign images of other, different groups)

Figure 19.4 Worksheet 2

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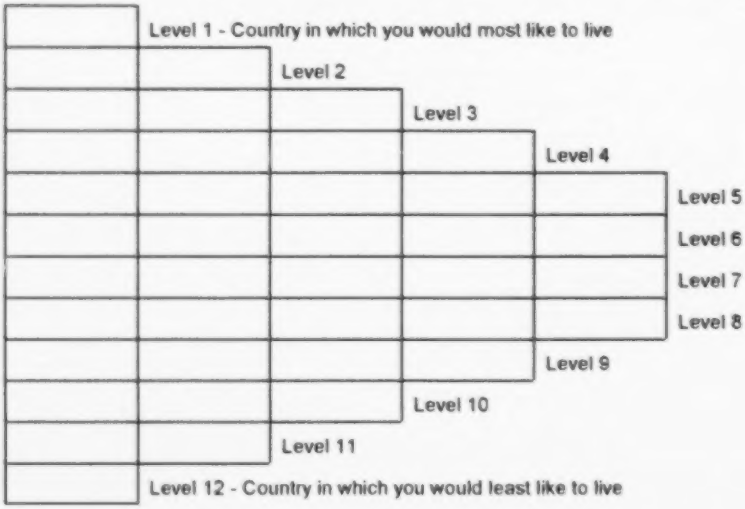
A PREFERENCE SORTING DIAGRAM

Where would you like to live/to work/to stay for holidays?

If you like, you may incorporate into the diagram nearly all countries of the below list. If this is too much for you, choose at least countries for the 2 most and the 2 least liked levels.



(Slater 1982)

This list may be changed.

Belgium	Italy	Greece	USA
Iceland	Spain	Russia	Brasil
Ireland	Turkey	United Kingdom	Egypt
Netherlands	Serbia	Portugal	South Africa
Germany	Albania	Romania	India
Norway	Sweden	Luxembourg	China
Finland	Ukraine	France	Japan
Estonia	Poland	Canada	Australia
Czech Republic	Moldova	Bosnia-Herzegovina	Congo
Hungary	Austria	New Zealand	Cuba

Figure 19.5 Worksheet 3

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QUESTIONNAIRE

Attachment and Identity

People have different loyalties or feelings of warmth towards their own nation, to Europe, to humankind, to their region and to their place of residence.

Please indicate your personal position according to the following system of points:

0 : not
1 : a little
2 : some
3 : strong
4 : very strong

I feel attached to:

my nation _____

my region _____

my place of residence _____

Europe (as a whole) _____

Europe (the European Union) _____

humankind _____

Africa _____

Asia _____

South America _____

USA _____

South Africa _____

Serbia _____

(If you wish, you may change the above list!)

Figure 19.6 Worksheet 4

CONTENT ANALYSIS

How 15 years old students see their own and other people

Which areas are the students writing about?
How strongly do they feel about the different aspects they write about?

The following list may help you to answer the questions.

1. *Read the essays provided.*
2. *Mark each content of the checklist when you find it written in the essays.*
3. *Give this content a mark between 1 (weak) and 5 (strong) according how broadly and deeply it is described.*

Checklist of contents:

10 nature
11 situation
12 size
13 vegetation
14 animals
15 climate
16 soil
17 raw material
18 landforms
19 water resources

20 economy
21 foreign trade
22 industry
23 agriculture
24 mining
25 services
26 development
27 technology
28 transport

30 culture
31 language
32 architecture
33 tourism
34 attractions

40 population
41 society
42 clothes
43 food
44 leisure
45 living standards
46 education
47 capital
48 home community
49 home country

50 social environment
51 settlement
52 mobility
53 history
54 inventions
55 religion
56 urbanisation

60 politics
61 military
62 war
63 international understanding

70 values/attitudes
71 identity
72 international cooperation
73 peace
74 image
75 human rights

(You may add other contents. It would be interesting to exchange similar essays with students in other countries)

Figure 19.7a Checklist of contents

HOW I SEE ENGLAND

Andrea Lyons, a 15 years old student from England wrote in 1987:

"To write generally on the English people and the English way of life is a difficult task as throughout the country the people and their lifestyles vary greatly. To write about this subjectively, including opinions, is even more difficult as one knows, usually from personal experience. I do not, of course, know all the people in England personally, or their attitudes and opinions of their life in England or of the country itself, I can only give you my opinion and I hope to project to you an image of England and the English people as the English see it.

In England, as in all countries, there is a social hierarchy. This is not as definitely defined as it was in the nineteenth and early twentieth century. Today the upper class and upper middle class merge together and the lower middle class and the working class merge together also.

The upper class consists of the Royal family, titled aristocrats and important members of Parliament. The middle class is much more difficult to define. This is made up of members of Parliament, business owners and important people in industry. The working class consists of "ordinary" people, workers, tradesmen, shopkeepers, the unemployed - making up the majority of the population. There have always been more working class people than middle or upper class and with the help of unemployment in England, this is still true today.

In the 1960s and early 1970s the image of a typical English family was of a reasonably happily married couple, with two children. They lived in a semi-detatched house in suburbia and the father had a 9 to 5 office job in the town, which he could reach in his English car each day.

Since the mid-70s a different and less pleasant, if the above image can be called pleasant, image has developed. There is a large scale unemployment, so a typical family would now have one parent unemployed and live in substandard housing, with the children attending the local comprehensive school.

Unemployment, or the threat of it, has become a part of every English person's life. It is a growing problem in England, caused by an economic depression which cannot be ignored. But it is only those people hit by unemployment whose lifestyles have changed greatly. The lucky people who have been unaffected, have felt little or no change to their lifestyle by unemployement.

Most English people have a set picture in their minds of how they imagine foreigners to be. They have a different image for each country and this picture rarely changes, even after visiting the country and meeting its inhabitants. The English are stubborn and do not change their mind so easily. So, probably, do all foreigners have their own set image of the English in their minds.

Most foreigners see the English as cool, unemotional and standoffish. This is often referred to as "English reserve", and admittedly it does exist.

When visiting a foreign country, especially a European country, one notices that the people greet each other profusely, with handshakes, kisses and embraces, a rare sight in England. When visiting France last year I realized my own "English reserve" on meeting the family with whom I was to stay. I had expected a friendly "bonjour" and a handshake from the parents. But to my surprise, and I must admit, considerable discomfort, I was hugged and then kissed several times on each cheek by every member of the family. I got used to this ritual each morning before breakfast, and each evening before retiring, though never did I learn to enjoy this affection.

I feel no strong patriotism to England or its rulers, probably because of the terrible state that the country is in. To me it is simply the country in which I was born. After saying this I must admit that I could not live permanently abroad, because I view England as my home and have a sense of affection for the country. Most English people have an often unconsciously strong patriotism towards England and the Royal family. Few people feel strongly for the government because of its relatively transient nature. But the Royal family are viewed with affection and respect by the majority of English people.

The English people have their bad points, but you will find that the majority of us are just like you, good people at heart but we all have our faults."

Figure 19.7b

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HOW I SEE USSR (1987)

Nickolai Naidenov, a 15 years old student from USSR, wrote in 1987:

"My name is Nickolai Naidenov. I am 15 years old and a member of the Young Communist League, a student of a Moscow school. But first of all I am a citizen, a citizen of for me the best country in the world - the Union of Soviet Socialist Republics. And I am proud of it.

In my short essay I want to show how my being a Soviet citizen affects my life.

I could realize it all throughout my life. Since my early childhood I have been and still am under doctor's care. If I get ill a doctor pays me a visit, consults me, sets a diagnosis, prescribes medicine and gives advice what is to be done to recover sooner.

The state also makes sure that all the talents children may have will be revealed and promoted.

Our school is forty years old. It has got rich traditions and a wonderful collective of teachers. At school we do not only have regular classes but we learn much about cars and get our driving licences with our matriculation certificates. It gives us a right to drive various kinds of cars.

We have a school farm not far from Moscow where we grow fruit and vegetables. In summer pupils of the 7th, 8th and 9th forms go there "to work a rest" camps. There we learn what real work and friendship is. We get stronger and healthier both physically and mentally. Junior schoolchildren go to the farm in autumn and in spring to prepare land for summer and winter seasons.

At our school we have many optional courses, a music circle, a drama circle, etc.

At school we have a Club of International Friendship which maintains correspondence with schools and some children from many countries in the world. Recently our school was visited by delegations from France, Finland, Italy, East and West Germany, the USA, England and countries from Latin America. With all these countries our club maintains permanent relations. And this we consider to be our humble contribution to the course of the development of cooperation between nations. To reveal students' abilities we have regular contests in different subjects.

City contests are usually held in Moscow Palace of Youth and Schoolchildren. It is a real palace made for children. There are about nine hundred hobby groups and studios where more than twenty thousand children come. The tuition is free and classes are in well-equipped and modern rooms.

Music classes used to consume all my free time but now I have graduated from the music school and I have decided to go in for sports. I go in for track and field sports, attend training lessons and have excellent coaches. And for all this I don't have to pay a penny either.

So in all spheres of our life whether it is school education or work or leisure or medical treatment, I permanently feel the care of my State about me."

Figure 19.7c

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HOW I SEE RUSSIA (1995)

Nadezhda Shestopalova, a 15 years old student from Russia, wrote in 1995:
"I'm a high school student. A few years ago our school was transformed into a gymnasium (grammar school). We started to study more humanitarian subjects such as Psychology and Sociology. The programs on other subjects, such as History, Literature, Foreign Languages, were expanded. We have additional courses, special seminars and other interesting activities that we never had before. But still we have subjects like Maths, Physics and Chemistry. In my spare time I attend the local Art School where I learn how to draw and paint. My precious dream is to visit a Haute Couture Week in Paris some time.
But the most important activity for me is studying. I spend very much time doing my homework, special projects for school, extracurricular activities. One of my favourite subjects is Russian history. If you have ever got to study Russian history, you would agree with me that it is so significant and mysterious, considering the magnificance of the beginning of the nation, its development through the years and centuries, its achievements and failures, light and dark sides.
Russia - eternal enigma of the worlds and generations. Fields, rivers, mountains, plains -all this is our vast country. I love Russia but I cannot explain why. This love comes from my very heart and maybe that is why it is so complex. I was born here and I'm grateful to my destiny for that. I'm happy that I can walk around rainy Moscow along its old streets and pass by different people, to shake snow off fir trees and to visit Russia's quiet villages. When I feel blue I like to go to the river bank. In winter I like to ski and in summer to get sun-tan on the roof of a big house. I may sound too romantic but it is true, I do feel romantic about my country. No hardships will ever change this feeling. I believe in Russia's future, I believe that Russian people's hearts will resurrect the country. There is a Russian proverb:
"Motherland can live without her citizen but could a man live without his Motherland?"
I don't think I could. I hope that one day I will be able to do something for my country.

Figure 19.7d

HOW I SEE EUROPEANS (1995)

15 years old Australian students wrote about Europe in 1995:
Natasha: "I think of Europe doing a lot of damage to the rest of the world, especially to the countries that they've colonised and now we're seeing the result of a lot of that. They've all tried to grab at the same sweet and they've had a bit of a fight and no one actually got the chocolate at all and now the chocolate is deciding on its own."
Bianca said: "When I think of Germany, I think about the war."
Ben: "Germany. Its democratic now, isn't it?"
Susan: "I know it's much better than it was twenty years ago when they were living in poverty."
Natasha: "There are a lot of ethnic clashes between the people in the Balkans."
Michael: "I know that in Serbia there are Moslems, Croats and Serbs. They're all fighting. They just want control over their country just because they're religious orientated. They don't want the other ones there."
Alexandria: "Its hard to think of England as Europe."
For Dougal, on a trip to Europe he would expect to experience: "probably a lot of cold weather, snow, the climate would be a lot different. A lot of their monuments like the Tower of Pisa, Eiffel Tower, Big Ben and all those sorts of monuments. Mainly like holidaying and stuff, like skiing, sightseeing and stuff cause that's mostly Europe, really full of tourism things."
Duncan: "You hear about, say, the Germans and stuff and the Scottish with their kilts and when they have festivals and they all dress up in their traditional gear they used to wear ... like a couple of hundred years ago."
When asked about her images of Hungary, Poland, the Czech Republic, Bianca commented: "They seem to be more Asian countries to me. I can imagine people dancing and different styles of music and different religions. They're definitely not Christian. I imagine them with lots of colours and more civilised."
Margaret described Spain as having: "all the guys with all the really good bodies, tanned, black haired and mysterious. They're wealthy, and in Switzerland is snow, a really magical place, like an ice wonderland, like an Alice in Wonderland in the snow where everything is just wonderful and you have a fantastic time."
Natasha: "I wouldn't think of Europe as a whole really. I think of it as separate nations."
Mara's view of Europe came through her immediate listing of country images: "France is known for the Eiffel Tower, Germany is known for the Second World War, Switzerland and Austria are known for their ski slopes, Portugal is known for its bull fighting."

(Source: Lidstone 1995)

Figure 19.7c

RESULTS AND CONSEQUENCES
OF
THE IMAGE ANALYSES

Perhaps you have found very friendly or fair images?
But also it could be that you have found prejudices and stereotypes!
Try to explain the outcomes, and discuss with your class whether you can agree with the following statements or not:

1 Stereotypes are fixed and more or less unchangeable images about other people.

2 There are many stereotypes that do not encourege interpersonal and international cooperation.

3 Most images about foreigners are not real stereotypes but rather simplified and incorrect images that contain both real and false attributes.

4 Individuals in a nation show many differences but they also have features in common. A descripton of this common structure must be an abstraction.

5 Such images help to understand other nations, but they do not contain the whole truth.

6 We must be careful when we describe other people. We should always be conscious that we only possess a part of the truth and that people and individuals can change their habits.

7 When we wish to understand other people we must build an image about them even if it is an incomplete one.

8 When we seek to establish good relations with other peoples, we should try to develop images that are as realistic as possible.

9 We should try to de-emphasize differences and emphasize similarities among people.

10. We should appreciate different races, nations, cultures, and groups for the rich potential they offer humankind's future development.

11 When we want to promote international understanding and cooperation, we should contact other people such as students and schools in other countries to try to exchange ideas, pictures, goods and essays on self-images.

12 We should show our solidarity with people by assisting them when they need help.

Figure 19.8 *List of hypotheses or rules*

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SECTION E

CURRICULUM DEVELOPMENT

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CURRICULUM DEVELOPMENT: INTRODUCTION

Joop van der Schee

Although the editors of this book and the organizers of the IGU Congress in The Hague 1996 did not plan a subtheme on curriculum development in geography teaching, many geographers wrote a contribution on this subtheme for this book and for the congress proceedings. This illustrates the importance of the issue. Changes in the school geography curriculum have an immense impact on everybody involved in geography teaching.

In chapter 20 Naish mentions several models of change presented in literature before he describes the new National Curriculum of England and Wales as an example of a Centre-Periphery change, largely unsupported by any research phase. In the following section Naish concentrates on practising teachers involved in an in-service education course on managing change in a geography department. The Geography 16-19 project is used as a case study of a system-wide approach to curriculum development. Teachers are asked to reflect on the dissemination of innovations. Naish discusses the issue of effective strategies for change in geography teaching and ends up with a remark about the great need for more research in geographical education.

Williams' contribution in chapter 21 contains an interesting debate about the gap between geography teaching in primary and secondary education. Curriculum coherence between primary and secondary schools in England and Wales does not seem to exist. In his student materials Williams challenges students to reflect on curriculum bridges between primary and secondary education specifically for environmental education. The presented checklists in this article are useful to control the issue of coherence in existing and new geography curricula.

The process of revitalization of geography in the United states is described by Stoltman and Wardley in chapter 22. It is fascinating to read this contribution with the remarks of Naish about successful curriculum change in mind. The important role of the Geographic Alliances and the National Standards is clear in the process of curriculum change in the United States.

Although the three contributions in this chapter at first sight seem to describe the specific situation of the geography curriculum in certain countries, close reading shows that that is not true. All three articles raise topics about curriculum development which are very important in many countries. The variations in curriculum change between countries can be a fruitful starting point for an international discussion on curriculum development.

20 DEVELOPING UNDERSTANDING OF THE DYNAMICS OF CHANGE IN THE GEOGRAPHY CURRICULUM

Michael Naish

"There is, in public affairs, no state so bad, provided it has age and stability on its side, that is not preferable to change and disturbance." (Michel de Montagne 1533-1592)

"Plus ca change, plus c'est la meme chose." (Alphonse Karr 1808-1890)

20.1 Introduction

As these quotations suggest, change is not a comfortable phenomenon. People tend to be wary of change - to shy away from it rather than welcome it. A common defense is that change is simply for the sake of change and therefore probably to be avoided. Where change can be seen to be essential if a situation or condition is to be improved and developed, people may be more disposed to accept it.

The focus of this chapter is change in the school geography curriculum. Traditionally there has been resistance to curriculum change and development, possibly for the basic reasons suggested above. The chapter is based on the assumption that teachers, whether in initial teacher education (ITT), or in in-service education (INSET), will be more disposed to consider innovation and development in a positive light if they are aware of the nature of dynamics of change in the curriculum.

20.2 Theoretical underpinning

There is, as is well known, a considerable literature on the nature of change and the diffusion of innovation. Some of this body of writing is specific to the curriculum and to the geography curriculum in particular: some is more broadly based and relates to change in society or to innovation in the development and marketing of products or the diffusion of ideas.

In education, interest in change developed rapidly with the movement for curriculum change and development that began notably in North America in the 1950s, and was stimulated by the alarm generated by the Soviet lead in the space race symbolised by the successful launching of the first Sputnik. In the English speaking western world, some elements of the work on curriculum development can be traced through the writing of, for example, Hoyle (1969), Kelly (1989, 1990), Lawton & Chitty (1988), MacDonald & Walker (1976), Plaskow (1985), Rudduck & Kelly (1976), Skilbeck (1984), Stenhouse (1975), Taba (1962), and Tyler (1949).

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Writing focusing on the nature of change in the curriculum includes that of Blenkin et al (1992), Calderhead (1988), Carlson (1965), Corey (1953), Elliott (1991), Fullan (1982), Goodson (1987), Holt (1990), MacDonald & Rudduck (1971). For a specifically geographical point of view, we can turn to Catling (1992), Dalton (1988), Boardman (1985), Graves (1979), Naish et al. (1987), Naish (1992), Stoltman & Libbee (1988).

Key texts on change from the broader perspective include those of Bennis et al (1969), Havelock (1971), and Schon (1971; 1983). These writers created models of change and diffusion from their analysis of change strategies over a number of years. The expectation is that such models will certainly have descriptive properties, but may also help in the explanation of change and even have some predictive or prescriptive potential.

The models proposed by Havelock and Schon are especially well known in many fields Perhaps the most influential in the field of education have been Schon's Centre-Periphery model and Havelock's Research, Development and Dissemination model. It is notable that these models tended to be reflected in the work of the early Schools Council curriculum development projects in England and Wales, from about 1965, when project teams would work at the centre on the production of a package, sometimes based on preliminary research, and then try to disseminate their package to the schools on the periphery. Earlier knowledge and understanding of Schon's Proliferation of Centres model and Shifting Centres model and of Havelock's Social Interaction model and Problem-Solving model, might have led to more effective take up of the innovations.

Bennis, Benne and Chin, writing earlier than Schon and Havelock, had suggested that there are three groups of strategies for change. The first group is that of Empirical-Rational strategies, which assume that people are rational and will act in accordance with their rational self-interest. The change agent's task is therefore to demonstrate the potential of the change in terms of the increased benefits it offers the potential user. The second group, that of Normative-Re-Educative strategies, assumes that people invest their commitment in socio-cultural norms and that change depends on them discarding their normative assumptions and developing commitment to new ones. The third group, that of Power-Coercive strategies argues that change can be effected through the application of power, whether this be economic, moral or political power.

I find it interesting to reflect that the most powerful and rapid changes in the curriculum of England and Wales have been carried through using this last strategy used in a Centre-Periphery mode. One example of this was the exercise of power by pouring large sums of money into the system through the Technical and Vocational Initiative from the early 1980s. In this case, capital equalled power. The second example was the gradual assumption of power over the curriculum by the government, again from the early 1980s, which culminated in the Education Reform Act of 1988 and imposed compulsory change through a National Curriculum in a newly centralised system. The National Curriculum of England and Wales is a prime example of a Centre-Periphery change, largely unsupported by any research phase. In fact established research findings and twenty years of experience of developing school centred curriculum change were totally ignored by those taking through what has become know as the New Right revolution.

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There is no space to go into further detail about the theoretical underpinning of approaches to change, dissemination and diffusion. The field is extensive since it includes, for example, the whole area of developing and marketing products. It is hoped that the brief discussion above will demonstrate how essential it is for hard pressed teachers, constantly assaulted by pressure for change and development, to be aware of the broader field and to understand something of the theoretical underpinning which is available.

20.3 Methods: involving teachers in thinking about change

An important element of courses for geography teachers involved in ITT and in INSET at the University of London Institute of Education is development of awareness about the dynamics of change. For the purposes of this chapter I intend now to concentrate on practising teachers involved in an in-service education (INSET) course on Managing a Geography Department. A section on Change is an important element of such a course, since it is part of a Head of Department's (HOD) role to manage change imposed from internal (school) or external (e g government) sources.

20.3.1 Becoming aware

This introductory session on managing change takes the form of a number of activities designed to involve the teachers in thinking into the topic for themselves. This is because one of the basic purposes of in-service work is to help develop teacher professionalism through encouraging a critically aware attitude towards every aspect of their work and role. The premise is that critical, reflective practitioners are likely to be more effective as educators than those who go about their work in an unthinking and uncritical manner.

The aim of the session is to involve teachers in a consideration of the nature of change and its impacts and through this, to help them reflect on their own attitudes towards and strategies for managing change. As an opening activity, designed to establish the interactive style of the seminar, teachers are asked if they can recall any quotations about change. Commonly someone will suggest the Alphonse Karr quotation given at the head of the chapter or some other item. If none are forthcoming, the tutor can suggest a few of the sometimes amusing items given in a dictionary of quotations such as that of the Oxford University Press (1979).

The teachers are then asked to discuss with a neighbour their own attitude towards change - how they feel about change in general. Do they see it as a good thing or do they have some inbuilt resistance? They are encouraged to be open and frank about this and to report general findings to the whole group. Next they are asked to list individually significant changes that have had impacts on them as teachers in their schools. A list of examples can then be built up on the chalk board or flip chart and it is usually notable that there have been certain common experiences. In a recent discussion, for example, some shared experiences of concern amongst the group of teachers included planning for new courses for 14 to 16 year-olds; reacting to changes initiated through TVEI; developing Records of Achievement and planning units for the National Curriculum for 11 to 14 year-olds.

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As a result of discussion of these findings, teachers reflected on the fact that there had, in recent years in England and Wales, been a change from teachers being pro-active, that is having responsibility for initiating change, to a far more re-active role, where they found themselves having to react to the requirements of the National Curriculum and other centrally proposed strategies. This led to some agreement that one of the driving motives behind the New Right revolution in education had been to reduce the level of responsibility of teachers in curriculum decision making and to make them focus on the "delivery" (an expression of the New Right) of the centrally prescribed curriculum.

Further discussion ensued on the accompanying characteristics of such change, including, for example, the enormous increase in bureaucratic work recently imposed on teachers, thus diverting them from the central element of their role - that of teaching the children. Reviewing some recent newspaper cuttings substantiated several points in the argument, while it was recognised that such evidence is subject to bias.

A final small group discussion in this section of the work led teachers to consider who had been most centrally affected by the changes they had been considering. It was concluded that the person most concerned is normally the Head of Subject, who must take responsibility for consideration of the impacts of each change initiative and of whether, how and when to take appropriate action.

The next stage is for the teachers to consider some of the theoretical background to thinking about change. For this they first examine the models proposed by Havelock and Schon and try to relate these to actual examples in their own experience of innovation in education. Next they move on to consider a recent analysis of approaches to considering and researching change by studying the six theoretical perspectives on change proposed by Blenkin et al. (1992), viz. the technological, cultural, micropolitical, biographical, structural and sociohistorical perspectives. Again, they reflect on these perspectives from the point of view of actual examples of change in geography education and in the education system in general.

The next stage is for small groups to discuss what changes they will anticipate having to face in the next 18 months. They then select one particular example from their list and work together to propose a strategy for managing this example. In a recent session, teachers chose to work on the problem of implementing the new changes to the national Curriculum in geography at Key Stage 3, that is for 11 to 14 year-olds, in this workshop activity. During the plenary feedback of their strategies, the teachers were asked to think about further elements of the change process, such as who are the actors in the situation? Are they pro-active or re-active actors? Who are the decision makers? Who are the gate-keepers? What is the leadership style of the strategy? What are the external influences? What resistance to change might be expected and how can this be overcome?

20.3.2 Achieving change through curriculum development

In a follow up session on innovation, change and development in the geography curriculum the Geography 16-19 Project is used as a case study of a system-wide approach to curriculum innovation. The purpose of the session is to analyse the approaches adopted by the project

to attempt to achieve genuine change in the quality of educational experience offered students studying geography in the 16-19 age range. For this cohort, the main examination course on offer is the General Certificate of Education Advanced Level, generally know as A-level, and for the purposes of this chapter we shall focus on the A-level work undertaken by the Project.

The first part of the session involves a brief presentation by the seminar leader on the way in which the project worked. The Project encouraged a school based approach to curriculum development by setting up groups of pilot teachers in England, Wales and Northern Ireland who would work with the project in every stage of the development. These groups were given support in terms of personnel from the employing authority and from higher education and in terms of a financial input to enable them to purchase materials and travel to meet in groups and with the central team. The three team members travelled to meet and work with the groups through the early stages of the project's work. The teachers in the seminar are now asked to reflect on and suggest reasons for this approach. They are expected to suggest that the project would gain from the expertise of the teachers, that the work would be rooted in the reality of the school and classroom, that teachers would, at a later stage be producing and trialling teaching materials, that they would act as problem-solving initiators of change, feeding ideas, comments and advice through to the central team and that they would form effective shifting centres and local social interaction groups at the stage of dissemination, diffusion and take up. A further and very important reason for the involvement of practising teachers in this way was that one of the aims of the Project was to help develop teacher professionalism, and creative involvement in a national curriculum development project proved to be a very constructive form of in-service enhancement.

Working with this system of schools and teachers, with an effective advisory committee and with a group of formative evaluation contributors, the Project went on to analyse the needs of the students and the changing nature of the subject. Putting this evidence together, it proposed broad aims for Geography for 16 to 19 year-olds. To enable such aims to become operational, it produced a Curriculum Framework which proposed a particular approach to the subject, the People-Environment Approach, and an active, enquiry approach to teaching and learning.

Enquiry was fully embraced by the Project because it offered the opportunity for cognitive and skills learning and development. The adoption of the people-Environment Approach meant that students would be studying the questions, issues and problems that arise from the interaction of people with their varied environments. Because of the value laden nature of such questions, issues and problems, students would also be involved in investigation of the values of decision makers with regard to the use of space. Such analysis would enable them to begin to clarify their own values with respect to these issues (Naish et al. 1987).

The Advanced-level course, offered by the University of London Examinations and Assessment Council (ULEAC), was developed from this Framework has become a market leader in terms of the number of students taking the course. The ideas of the Project have been influential in the development of courses for 14 to 16 year-olds, the General Certificate of Secondary Education (GCSE) and in the character of the Subject Core for A-level, published by the government in 1993. There has also been a more widespread influence internationally (Naish, 1990)

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In following through this outline of the Project's work, the teachers are asked to reflect on the significance of each element for its impact on managing the innovation and its dissemination and take up. The obvious question is why has the dissemination been so successful in terms of the most basic of measures, that of student take up? Factors discussed include:

- the establishment of the system for involvement discussed above
- early publicity for the Project (Naish 1976)
- a system-wide approach, involving teachers, lecturers in Higher Education, inspectors, advisors, Examination Boards
- a publication programme throughout the life of the Project, i.e. articles in journals etc.
- team members offering lectures and seminars at courses and conferences
- running an annual weekend conference at Burwalls, Bristol and later at Leeds
- producing a number of examination courses available nationally
- offering local advice on the main examination course through a system of regional moderators
- offering feedback on course planning and assessment
- publication of teaching materials
- provision of an after-care service for schools taking up project courses
- continuing with in-service provision after the demise of the original project team
- involvement of practising pilot teachers in dissemination of the Project.

20.3.3 Using assessment as a means of curriculum change

One of the main planks of the Geography 16-19 Project argument is that enquiry learning is essential if geography is to play its part effectively as a medium for the education of young adults. Through enquiry, students will be researching significant questions about the interaction of people and their environments, using the kinds of enquiry techniques which geographers may use. In this way, they will be extending their knowledge and understanding and developing a range of skills and abilities. To practise the skills employed by geographers, they must also learn a range of suitable techniques.

The Geography 16-19 Project did not invent enquiry approaches to learning, of course, but it did have the opportunity to try to ensure that teachers would have every encouragement to use such approaches rather than to rely on lectures and the dictation of notes. One of a range of strategies adopted was to ensure that the assessment system for the A-level course would promote enquiry approaches to teaching and learning throughout the two year course. For this reason, the assessment consisted of examination papers using data-response questions, coursework assessment based on the application of a suitable technique to a question or issue, coursework employing a research essay, and an individual study involving the students in field enquiry at first hand, backed up by the use of secondary sources and a decision-making exercise. There was also a timed essay, relying on recall, as another element of the coursework. In the revised syllabus to be taught from September 1995, most of these enquiry orientated styles of assessment item have been retained although the proportion of coursework has been reduced due to government constraints.

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As part of an enquiry exercise to bring out the nature of the assessment system and its intended impact on teaching and learning strategies, teachers on an INSET course are invited to analyse an example of the Decision-Making paper. These assessment items follow a basic common format. Candidates are provided with a set of data related to a particular issue. They are usually placed in role and asked to analyse the data, clarify the issue and recommend a solution to the problem or a decision with regard to the issue in the form of a written report. The time allowed for this assessment item is, at the time of writing, two-and-a-half hours.

The paper taken in June 1994 provides a good example of a Decision-Making Exercise. On this occasion, the candidate is asked to adopt the role of a student undertaking his/her work experience with an Business Consulant Company based in Cardiff. The task assigned is to assess the suitability of three industrial estates in Rhondda Borough in South Wales, for a West London food packaging manufacturer, who wishes to establish a new branch in South Wales.

Each candidate is provided with a wide range of resources, which include: an extract from the 1:50,000 topographical map of the area; coloured photographs of each of the estates; a site map for each estate, together with data about unit size, occupancy, business, number of employees and rent (Figure 20.1), a diagrammatic profile of the food packaging company; statistics comparing the socio-economic profile of Rhondda Borough with Mid Glamorgan, Wales and Great Britain, including population figures, socio-economic groupings, condition of the coal industry and the employment and unemployment situation. Finally there is a set of brief comments from people who live and work in the Rhondda and an information sheet on financial incentives in Mid Glamorgan, dealing with grants and loans available from, for example, Regional Enterprise Grants or the Welsh Development Agency.

In a fictional letter from the Company Secretary of the business consultancy firm, the student is provided with a full explanation of her/his task. The context for the exercise is established and the task is divided into four sections: assessing the physical and socio-economic environment of the area in order to analyse what it offers to prospective industrialist; a critical review of the financial packages on offer; an assessment of the potential of each site; and finally a justified recommendation of one particular site for the food packaging company.

Once the teachers on the INSET course have worked through some parts of the paper, they can begin to analyse the curriculum significance of this style of assessment. They are asked to discuss the following:

- What range of skills are the candidates involved in when working on this task?
- What are the implications of this type of assessment for the geography curriculum?
- What style of teaching and learning is encouraged by this type of assessment item?

Teachers usually suggest a very full range of skills, including time management, data analysis, data interpretation, map analysis and interpretation, synthesis of ideas, problem-solving, decision-making and communication. It will be noticed that not all of these skills are specific to geography. Some, such as the data and map analysis certainly are, but others, like the need for time management and for higher level cognitive skills such as synthesis, problem-solving and decision making are more generalised skills and abilities of a kind which may build in for continuing learning after formal education and for general life skills. It is argued by the project that geography should indeed be contributing to the development of both geography specific and of more general skills in this way.

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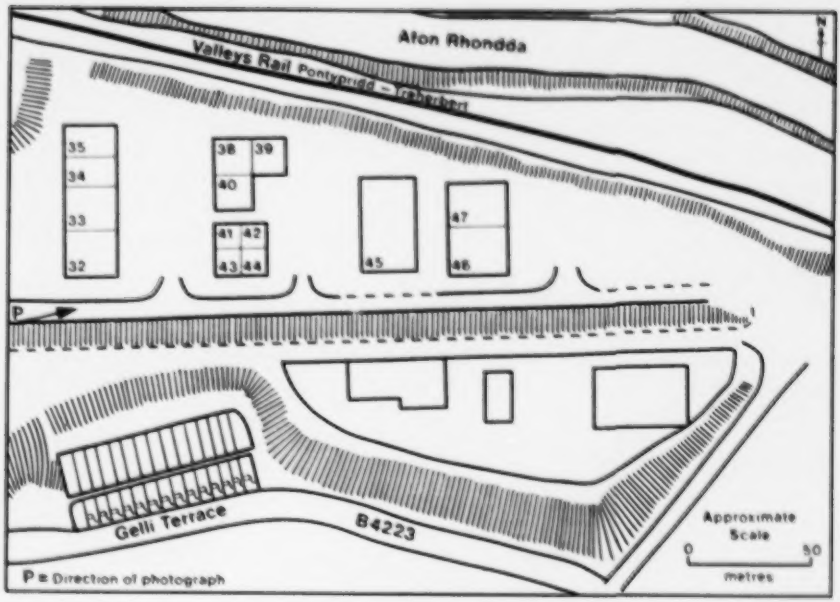

GELLI INDUSTRIAL ESTATE
(WELSH DEVELOPMENT AGENCY)
GR 983949

GELLI INDUSTRIAL ESTATE					
UNIT	SIZE (Per Unit) sq. ft. (sq. m)	TENANTS	BUSINESS	EMPLOYEES	RENT (Per Unit/p.a.)
32	4500 (418.0)	William Best	Ladies Wear	91	£13 500
33	4500 (418.0)	William Best	Ladies Wear	included above	£14 625
34	3000 (278.7)	New Aerials Ltd	TV Aerials	4	£9 300
35	3000 (278.7)	Vacant	-	-	£9 300
38	2000 (185.8)	Williams & Owen	PVC Windows	5	£14 800
39	2000 (185.8)	Vacant	-	-	£4 107
40	2000 (185.8)	Williams & Owen	As above	Included above with unit 38	
41	1000 (92.9)	Vacant		On application	
42	1000 (92.9)	Vacant		On application	
43	1000 (92.9)	PJT (Welding) Ltd	Welding	5	£4 100
44	1000 (92.9)	Vacant	-	On application	
45	10000 (929)	Vacant	-	On application	
46	5000 (464.5)	R & K Products	Metal Welding	21	£30 000
47	5000 (464.5)	R & K Products	As above		

p.a. = per annum

Figure 20.1 *Details of Gelli industrial estate: from the 1994 Geography 16-19 Project A-level examination. Source: ULEAC*

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The teachers will commonly suggest that further implications for the curriculum include a re-appraisal of the nature of geography and its value as a medium for education. Analysis of people-environment situations of the kind exemplified by this assessment item is a far cry from the inert study of regions or the bare systematic branches of the subject in a formal manner. Teachers will argue that in order to cope with a demanding assessment item of this nature, students need to have been practising analysis of situations through active enquiry throughout their two year course.

20.4 Conclusion

The obvious follow up for INSET work of this nature is to ask how effective such strategies for change are in practice. Evidence specifically related to the Geography 16-19 Project presents an interesting and challenging picture. The fact that many teachers make effective use of enquiry approaches is supported, for example, by observation, by the performance of their students in the examination and by small scale studies such as that of Stephens (1988). Recent work by the Curriculum Evaluation and Management Centre at Newcastle (ALIS 1994) suggests that there is still a considerable amount of expository teaching going on in the teaching of the Project's Advanced level course, including the dictation of notes. There is a great need for more research on teaching style and student response, preferably undertaken by teachers in an action research mode (Naish 1996).

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21 CURRICULUM COHERENCE: GEOGRAPHICAL EDUCATION IN THE TRANSITION FROM PRIMARY TO SECONDARY SCHOOLS

Michael Williams

21.1 Introduction

In planning school geography curricula and designing school geography syllabuses, geographical educators must take into account an array of factors including the nature of the subject, the characteristics of learners, the competencies of teachers, the availability of teaching and learning resources, the national curriculum culture, the school ethos and the classroom climate. Such factors, while easy to list, under close scrutiny are seen to be problematic. The notion that all that is needed in curriculum planning in school geography is to determine, at particular stages of schooling, a set of aims, a structure or framework of content, a list of teaching and learning strategies, and a mode of pupil assessment is flawed. While these elements recur in curriculum models (e.g. Tyler 1949, Taba 1962 , Wheeler 1967, Skilbeck 1976) they are meaningful only when contextualised in particular curriculum cultures. Elsewhere (Williams 1994) we have explored the concept of curriculum culture with reference to geographical education. Here, our focus is on curriculum coherence, that is, the whole geographical experience of pupils and students in schools and colleges from kindergarten to the end of upper secondary schooling. The concept of coherence is often discussed in the context of the whole curriculum (e.g. Weston et al. 1993) and, certainly, it is possible to discuss curriculum coherence in geographical education in this broader frame of reference. Thus the location of geography in the curriculum of a particular cohort of learners and in the whole curriculum experience of pupils and students in a given national educational culture is an interesting issue but it is one which we shall put aside in this chapter and instead focus sharply on the coherence of the geography curriculum.

21.2 Theory

Taba (1962, p. 382) asserted 'Scope, sequence, continuity and integration are the central problems of curriculum organization'. From this assertion we can go on to suggest that a coherent school geography curriculum is one characterised by an appropriate substantive scope, well-structured sequence and continuity, and rational and tightly organised integration. With regard to scope in geographical education, an analysis of this could usefully begin with definitions of school geography which seek to identify distinctive traditions, e.g. the four traditions proposed by Pattison (1964), or systems, e.g. the ecosystem paradigm proposed by Graves (1979). From a consideration of such approaches it is possible to argue that a

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geography curriculum is incoherent if it fails to take adequate account within the period of compulsory schooling of all of the identified traditions or systems and to provide sequential learning opportunities in each of them. In such a consideration, we would also need to heed arguments such as that propounded by Cohen (1988, p. 248, quoted in Gregg and Leinhardt 1994, p. 315),

> *"Studying 'the relationship between human activity and the environment, describing and explaining the significance of location distance, direction, spread and spatial succession' produces cohesive knowledge structures which contain information about the world in its natural context."*

This gives a sharper focus to the traditions and grows out of the primary role of geographic education defined by the Joint Committee on Geographic Education (1984) in the United States where five fundamental themes were specified: location, place, relationships within places, movement, and regions. Underpinning these themes is a concern with the scale of study and the need to provide opportunities for learners to study geography in local, regional, national, continental and international contexts. However, these must be translated from content into cognition, with the shaping of the themes into schemes of work and programmes of study which take account of the evolving cognitive abilities, aptitudes, interests and enthusiasms of young and dynamic learners.

Seeking coherence in the learning experiences of geographical learners is as important as seeking to establish substantive coherence. Coherence in learning experiences finds expression in the adaptation of teaching and learning strategies in geography to the developmental and maturational changes taking place over time in the learner and to the classroom climate and curriculum culture in which geographical learning takes place. While the developmental theory of Piaget (Inhelder & Piaget 1958) is helpful in this regard, it should be read closely alongside the work of Bloom and his colleagues (1956) in classifying learning objectives. The hierarchical structure detailed by Bloom can be given a developmental context, that is, the learner can be led over time from lower level objectives to higher level objectives, from those relevant to 'specific and relatively concrete types of behaviors (*sic*) to the more complex and abstract ones' (Bloom et al. 1956, p. 62). Acknowledging the significance of the terms 'knowledge', 'comprehension', 'application', 'analysis', 'synthesis', and 'evaluation', as used by Bloom and his colleagues, is crucial in the design of coherent geography syllabuses. They constitute one of the keys to unlocking the problem of achieving progression, continuity and sequence in geography courses and syllabuses.

Another key lies in the classroom climate in which geographical teaching and learning takes place. Nowhere is this more evident than in the transition from primary (or elementary) schooling to lower secondary schooling. Commonly, there are sharp discontinuities across an array of dimensions between these stages of schooling, including curriculum ideology, curriculum design, classroom ecology, preferred pedagogy and the professional characteristics of the teachers (Williams & Howley 1989; Williams & Jephcote 1993; Williams 1994a; 1994b). The notion that the geography curriculum for pupils throughout the period of compulsory schooling can be designed without close attention being paid to the curriculum cultures and classroom climates characteristic of the institutions and stages through which children must pass is inherently weak. A coherent geography curriculum must be contextually sensitive: its

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success lies in the balance to be struck between a substantive coherence and a pedagogical coherence which takes fully into account the school ethos and the national culture. The contrasts in curriculum culture in the transition between primary schooling and secondary schooling in England and Wales are highlighted in Figure 21.1. A consideration of these contrasts serves to bring into sharper focus the difficulties of constructing a coherent geography curriculum.

Curriculum Culture Characteristics	Upper Primary	Lower Secondary
Ideology	Progressive, child-centred, strong welfare orientation	Classical, subject-centred and vocational
Curriculum design	Topic or theme centred. Subject integration	Subject-centred
Classroom ecology	Open, generalist classrooms, mobile furniture	Specialist, subject specific classrooms, immobile furniture
Preferred pedagogy	Projects and topics. Active experiential learning, with many opportunities for fieldwork. Multiple learning resources. Mixture of work and play.	Subject focused. Much use of textbooks and teacher prepared worksheets. Fewer opportunities for fieldwork
Teacher	Generalist, trained through 4 year undergraduate (B.Ed.) or 1 year, PGCE, teacher training course	Specialist trained principally through 1 year PGCE teacher training course

Figure 21.1 Contrasts in curriculum culture between upper primary and lower secondary schools

Bennetts (1986, 1995) has offered useful guidance on how to give substantive coherence to the geography curriculum. He distinguishes between grouping, sequence and progression. With regard to grouping he demonstrated how related topics can be grouped within either an area-based or a thematic-based framework. Turning to continuity, he writes (1995, p. 75),

> *"The idea of continuity suggests the persistence of significant features of geographical education as pupils move through the school system. Such features could include aspects of content, particular types of learning activity or common assumptions about the nature of the subject."*

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It is in this notion of continuity that we include the concept of a 'spiral curriculum', where, as the pupil matures and passes from stage to stage and year to year, he or she returns to lessons already learned and the learning is reinforced, extended and enhanced. It is associated with the concept of progression which, according to Bennetts (1995, p. 75),

> *"can be applied both to the design of a curriculum, in particular how the structure of content and sequence of learning activities are intended to facilitate advances in learning, and to the gradual gains in knowledge, understanding, skills and competencies which pupils actually achieve."*

Bennetts has shown how this definition can be applied in the secondary school curriculum with reference to the themes of routes and route networks (1986, p.161) and economic activities (1995, p. 77). It is useful to place these applications alongside other more detailed ones presented by Her Majesty's Inspectorate (1986, pp. 49-57), which focused on the theme of manufacturing industry, Boardman (1986, pp. 136-137) on mapwork skills, and Sandford (1986, pp. 140-141) on atlas map skills. The account by Her Majesty's Inspectorate served to illustrate a number of key principles of progression (Her Majesty's Inspectorate 1986, pp. 40-41):

- an increase in breadth of studies;
- an increase in depth of study;
- an increase in spatial scale of what is studied;
- a continuing development of skills;
- increasing opportunity for pupils to examine social, economic, political and environmental issues.

This is a useful checklist for teachers seeking to determine how far their exisiting geography syllabuses meet criteria of coherence and It is equally helpful when new syllabuses are being constructed. Bearing this in mind we can now turn to the application of the theory to the practice of curriculum planning in the context of teaching about the environment in the schools of England and Wales.

21.3 Methods

Although there is no legal requirement for teachers in primary and secondary schools in England and Wales to develop courses of environmental education, there has been strong non-statutory encouragement given for this by both the National Curriculum Council (1990) and the Curriculum Council for Wales (1991; 1992). Teachers have been encouraged to consider the environment as a cross-curricular theme and as an approach to the curriculum more than additional content, and to acknowledge that 'taking environmental education seriously has implications for all aspects of a school's life and work' (Curriculum Council for Wales 1992, p. 8). For the geography teacher the challenge is to identify how studies about (knowledge), *for* (values, attitudes, positive action) and *through* (a resource) the environment (National Curriculum Council 1990, p. 7) can be located within the teaching of geography as a separate subject and with reference to cognate subjects for pupils at various stages of intellectual development between the ages of 5 and 16.

Upper primary	Lower secondary
1. Rivers	1. Earthquakes
2. Weather	2. Rivers or Coasts
3. Economic Activities	3. Weather and Climate
4. Environmental Change	4. Ecosystems
	5. Population
	6. Settlements
	7. Economic Activities
	8. Management of Environments
	9. Resources and the Environment
	10. Global Environment

Figure 21.2 *Government Required Themes for Geography in Wales in the Upper Primary and Lower Secondary Stages*

A starting point for this is a close reading of the legal requirements for geography that have recently been published by the government. Here (Welsh Office 1995) we find details under the headings of geographical skills, places and themes for each of four key stages, related to age (5 - 7; 7 - 11; 11 - 14, and 14 - 16). Figure 21.2 shows the themes for the upper primary and lower secondary stages. To illustrate how environmental learning in geography is perceived on either side of the transition from primary to secondary schooling, we can quote the statements of aims (Welsh Office 1995) for two of the themes: Environmental Change in the Upper Primary and Management of Environments in the Lower Secondary:

Environmental Change

In studying changes to the environment, pupils should be taught to:

a identify ways in which people affect the environment, *eg. by quarrying, building reservoirs or motorways;*

b investigate ways in which people attempt to look after and manage the environment, *e.g. by restoring damaged footpaths or combatting river pollution.*

Management of Environments

In studying the management of an area of scenic attraction, pupils should be taught to:

a recognise why some areas are viewed as being of great scenic attraction and how conflicting demands on these areas can arise, *e.g. the impact of some leisure activities;*

b investigate how attempts are made to plan and manage such environments and how these can have unintended effects;

c examine ways in which some environments are conserved.

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These substantive aims have to be considered in the contexts indicated in Figure 21.1: the fundamental differences between the upper primary school and the lower secondary school in ideology, curriculum design, classroom ecology, preferred pedagogy and the professional characteristics of the teachers. Not only is there a distinctive coherence in the geography curriculum of the upper primary stage which contrasts with the coherence which distinguishes the lower secondary stage, there are also considerable difficulties in the way of establishing a closer relationship between the two stages. In addition to the differences shown in Figure 21.1, there are also problems related to the number of primary schools, each with its own particular geographical curriculum culture, that feed into the secondary school. These differences were demonstrated clearly in a study conducted before the introduction of a centralised national curriculum in England and Wales in 1988 (Williams & Howley 1989). More recently, a study conducted in three contrasting primary schools in Wales, which sought to investigate the relationships between environmental education and the promotion of national identity (Williams 1996), has demonstrated that, despite the pressure to construct a coherent geography curriculum for pupils in primary and secondary schools, the primary schools retain very distinctive curriculum cultures from school to school, and remarkably little progress has been made in establishing curriculum bridges specifically for geography between primary schools and secondary schools.

	Upper Primary	Lower Secondary
Domains COGNITIVE: Knowledge a) Key ideas b) Key concepts		
AFFECTIVE: a) Attitudes b) Values		
PSYCHO-MOTOR SKILLS a) Substantive b) Procedural		
Pedagogy FOR the Environment		
ABOUT the Environment		
THROUGH the Environment		

Figure 21.3 Designing a study of the environment: domains and pedagogy

The essential stages for understanding the issue of coherence are:

a familiarisation with the formal externally defined curriculum requirements;
b careful consideration of the items indicated in Figure 21.1;
c diagnosis of the needs, interests, enthusiasms, abilities and aptitudes of the learners;
d appraisal of the potential of the local environment for teaching geography;
e evaluation of the potential resources for facilitating teaching and learning geography;
f investigating the sequence of teaching units to incorporate progression in such aspects of geography teaching and learning as mapwork, fieldwork, and the growth of intellectual skills, bearing in mind the need to move from the known to the unknown, the concrete to the abstract, the simple to the complicated, and the locality to the globe.

21.4 Student material

Exercise 1

Using Figure 21.1 as a base, consider the implications of each of the curriculum culture characteristics for both the Upper Primary and Lower Secondary stages for the design of teaching and learning strategies with reference to the environment. Figure 21.3 represents the beginning of this process, giving a structure based on domains and pedagogy.

Exercise 2

In Figure 21.4 this exercise is extended by an analysis of the differences in:

- fieldwork;
- mapwork;
- and the attention paid to cultural identity

across the transition from primary to secondary schools. In the spaces, identify differences in aims, content, teaching/learning strategies and modes of assessment.

	Upper Primary	Lower Secondary
MAPWORK a) Aims b) Content c) Teaching/learning strategies d) Modes of assessment		
FIELDWORK a) Aims b) Content c) Teaching/learning strategies d) Modes of assessment		
CULTURAL IDENTITY a) Aims b) Content c) Teaching/learning strategies d) Modes of assessment		

Figure 21.4 Designing a study of the environment: fieldwork, mapwork and cultural identity

Exercise 3

In essence, the concept of curriculum coherence is concerned with he coherence of pupils' learning over the period of schooling. Discontinuities between stages of schooling threaten to break up the substantive coherence of the subject and they have serious implications for coherent learning. What are the consequences of a sharp transition from primary to secondary schooling for:

- pupils' prior learning (what and how),
- pupils' motivation (enthusiasms and interests),
- pupils' attitudes to geography lessons?

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22 GEOGRAPHIC EDUCATION IN THE UNITED STATES: SYSTEMIC REFORMS LEADING TO NATIONAL STANDARDS AND ASSESSMENT

Joseph Stoltman and Sonia Wardley

22.1 Introduction

Systemic educational reform in the United States has been the focus of both political and social debate since 1980. Two major components of the reform movement are national content standards and assessment of student progress. The theory underlying the role of standards and assessment in the reform process is as follows: in the absence of clearly defined academic standards and the means to assess student progress towards attaining those standards, education gravitates toward *de facto* national minimum expectations (Jennings 1995). The systemic reform in geography in the United States may be used as a case study to examine this theory.

Geography has occupied a surprisingly insignificant position in pre-collegiate education in the United States during the past fifty years (Natoli 1986). However, beginning in the 1980s, attention began to refocus upon geography and its role in American society. By 1994 the initiatives by professional and academic societies and individual geographers to introduce content standards were bearing fruit. The stages in the reform movement within geography clearly place it within the theoretical construct of systemic reform.

22.2 The stages in the reform of geographic education

Systemic reform in geographic education over the past 12 years can be divided into seven significant stages.

22.2.1 Stage 1: A nation at risk

In 1983 the publication by the National Commission On Excellence in Education entitled *A Nation At Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education 1983) sent shock waves through the ranks of public policy planners. In brief, the report claimed that the educational attainments for a large proportion of citizens had regressed to a level where it presented serious threats to the basic fabric of the country, including the social, economic and participatory aspects of governance and citizenship. While the publication did not address geography specifically, inferences were made from statistical data showing such trends as the following: during the period 1960-61, only 14 percent of the students in grades 7 - 12 were enrolled in geography courses, and by the mid-1970s the

percentage had dropped to 9 percent (Gardner 1986). It should be noted that this steady decrease in attention to geography occurred during a period when enrollment in grades K - 12 was increasing at a rapid rate.

After the publication of *A Nation At Risk*, there followed the actual documentation of this lack of geographic knowledge. A common approach was the administration of tests to students. These revealed students in the United States were lacking in basic geographic knowledge and in the skills for interpreting geographic information. They had little comprehension of international aspects of the world and their place and role in that world.

The testing of students for geographic knowledge had two important effects. First, it verified the geographic illiteracy of the student segment of society, an illiteracy that has been frequently generalized to include older Americans as well. Second, the testing caught the interest of the media. For the remainder of the decade, newspapers, television, radio, and numerous magazines continued to feature reports and articles about how little knowledge Americans had about the geography of their country and the rest of the world (Gallup Organization 1989b).

22.2.2 Stage 2: fundamental themes of geography

The publication of the *Guidelines for Geographic Education: Elementary and Secondary Schools* (Joint Committee on Geographic Education 1984) marked Stage Two. The *Guidelines* clearly articulated themes and concepts to teachers and writers of instructional materials in geography and social studies. The *Guidelines* were influential because they did three things. First, they communicated clearly to teachers the big ideas from geography that provided a structure for teaching. Second, they were memorable, and readily became a part of the common vocabulary that teachers used. Third, they were easily accessible in print, media, and through a wide range of applications. The reality was that the fundamental themes of geography diffused to the social studies and geography teachers in the United States very rapidly. This was the most far reaching and powerful of the stages in the 1980s, and one that has continued into the 1990s.

22.2.3 Stage 3: textbook driven curriculum

In the United States the educational system is reliant upon commercially published textbooks. One effect of the reform in geography was an increase in the number of commercial geography textbooks available. Between 1983 and 1988 16 new geography textbooks were published for secondary school students. As the reform has progressed, textbooks have been designed to include numerous ancillary materials, including atlases, hands-on kits, curriculum development-ROM and other software, networking, and video components. Whereas prior to the reform, a textbook was a book. Today it is more often an entire set of interlinked instructional components. These new materials sets are focused upon national content standards in geography and incorporate the most recent thinking about the content of geography within the school curriculum.

Professional organizations and societies are also promoting systemic reform through ancillary materials development, such as the American Geographical Society's Around the World Program (American Geographical Society 1995). Classroom teachers are also producers of materials for use by other teachers. One project that specializes in the dissemination of teacher designed materials is GeoLinks, a curriculum development-ROM project that incorporates more than 1000 teacher designed lessons (Salter & Salter 1995).

22.2.4 Stage 4: Geographic Alliances

The Geographic Alliance Movement clearly stands out as the major activity linking the reforms of the 1980s to those of the 1990s. The alliances are grassroots organizations of teachers committed to the improvement of geography teaching. The National Geographic Society provides base-level matching funding for alliance activities, high quality classroom and teacher inservice materials, and sponsors the annual Geography Awareness Week and National Geography Bee. Beginning with seven state geographic alliances in 1986, all 50 states in the country had alliances by 1993 (Grosvenor 1995). The alliances are the direct connection between systemic reform and the grassroots geography instruction that occurs in classrooms.

22.2.5 Stage 5: teacher training

The preservice and inservice training of geography and social studies teachers marks Stage Five of the reform. Teacher training is linked with the state geographic alliances, since much of the work they perform is training classroom teachers who have little knowledge of geography or how best to teach it. It also extends to the colleges and universities in the United States that prepare preservice teachers in the content and methodologies of the discipline. The lack of adequate preparation in geography for newly graduating teacher education students has been documented in numerous publications (Rutter 1986, Winston 1984).

Influencing teacher certification standards is a major task since basic teacher certification guidelines are established by individual states and organizations representing associations of states. Recommendations to improve preservice teacher preparation in geography have been forwarded to policy making bodies. The Geographic Education National Implementation Project (GENIP) has recommended course preparation in geography for future teachers of the discipline within the social studies and earth sciences curricula (Spetz 1988). Also the National Council for Geographic Education has developed the Advanced Professional Certification in Geography. This provides an opportunity for teachers to provide evidence that they exceed the norms and are well prepared academically in geography (National Council for Geographic Education 1995).

22.2.6 Stage 6: The National Content Standards in Geography

Geography for Life: National Geographic Standards 1994 (Geography Education Standards Project 1994) did more than extend the work that had gone into the *Guidelines for Geographic Education* ten years earlier. The Standards Project resulted in a total rethinking about geographic education in the context of systemic reform, and revisited the philosophical and research basis for the discipline in the school curriculum. The goal of the standards in geography was to identify content important to the development of a high level geographic perspective among students. This was consistent with national standards projects in other subjects, including mathematics, science, history, and civics (Lewis 1995).

The major purpose for national content standards is to guide the development of geographically informed students who (a) see meaning in the arrangement of things in space; (b) see relations between people, places, and environments; (c) use geographic skills, and (d) apply spatial and ecological perspectives to life situations.

The national geography content standards define the geographically informed person as one who knows and understands the six elements of geography and the eighteen content standards (1-18) that elaborate them, as follow:

1 The World in Spatial Terms
- 1 How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective
- 2 How to use mental maps to organize information about people, places, and environments in a spatial context
- 3 How to analyze the spatial organization of people, places, and environments on Earth's surface

2 Places and Regions
- 4 The physical and human characteristics of places
- 5 That people create regions to interpret Earth's complexity
- 6 How culture and experience influence people's perceptions of places and regions

3 Physical Systems
- 7 The physical processes that shape the patterns of Earth's surface
- 8 The characteristics and spatial distribution of ecosystems on Earth's surface

4 Human Systems
- 9 The characteristics, distribution, and migration of human populations on Earth's surface
- 10 The characteristics, distribution, and complexity of Earth's cultural mosaics
- 11 The patterns and networks of economic interdependence on Earth's surface
- 12 The processes, patterns, and functions of human settlement
- 13 How the forces of cooperation and conflict among people influence the division and control of Earth's surface

5 Environment and Society
- 14 How human actions modify the physical environment
- 15 How physical systems affect human systems

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16 The changes that occur in the meaning, use, distribution, and importance of resources

6 The Uses of Geography

17 How to apply geography to interpret the past

18 How to apply geography to interpret the present and plan for the future

These national standards were set by a consensus process which involved parents, academic geographers, business leaders, governmental officials, teachers, and administrators. They were released to the public in October 1994. By 1995, many state governments were not yet committed to the inclusion of national standards in their educational reforms. Thirty-six states were found to be participating in the standards setting process according to the data collected by the authors from state geographic alliance coordinators and described later in this paper. Those states had decided to use either the national standards as they were published, or in a modified form to meet their own particular educational mission. These data agreed closely with an earlier survey by the Council of Chief State School Officers which indicated that 35 states were either in the process of or had developed state content standards. The latter survey referred to all content areas, not just geography or the social studies (Council of Chief State School Officers 1995). Another survey by the American Federation of Teachers using similar criteria concluded that 27 states currently had standards and 23 were in the process of developing standards in 1995. In forty-six of the states, the focus of the standards was on the core academic subjects, such as geography, history, government, social studies, math, science, and language arts, or some combination of those (Gandall 1995)

22.2.6.1 Surveying The Status of the National Content Standards in Geography

In order to assess the extent to which national geography content standards were being considered at the state level of educational reform, a survey was made of the Geographic Alliance Coordinators in each state. The Alliance Coordinators are part of a network of geographers and teachers who are responsible for promoting the role of geography within their state. It was judged by the authors that the coordinators of the alliances would be a reliable resource regarding educational reform in each state and be aware of and be participating in the plans for implementing the national geography standards, either in whole or in part. The coordinators in all 50 State Geographic Alliances were contacted and asked to responded to a survey. Responses were returned by Alliance Coordinators in forty-seven of the states. In approximately half of these (49%) there are plans to mandate the inclusion of geography in state or local curricula. Currently only 23% of the responding have a mandated state curriculum, though more than half (54%) have a recommended state curriculum. The inclusion of national geography content standards within these state curricula has just begun. Only 19% have formalized a plan for their incorporation, while in a further 48% it is still under discussion.

Nearly all of the Alliance Coordinators who responded (94%) believe that the national standards will require modification for state and local use. Responsibility for that modification and subsequent implementation of national standards falls to a number of different state and local

policy-making groups as shown by Figure 22.1. The State Board of Education (39%) is the most frequently responsible, followed by Local School Boards (29%) and the State Legislature (8%). However 24% of the States surveyed have no formal policy-making structure for the implementation of the National Standards.

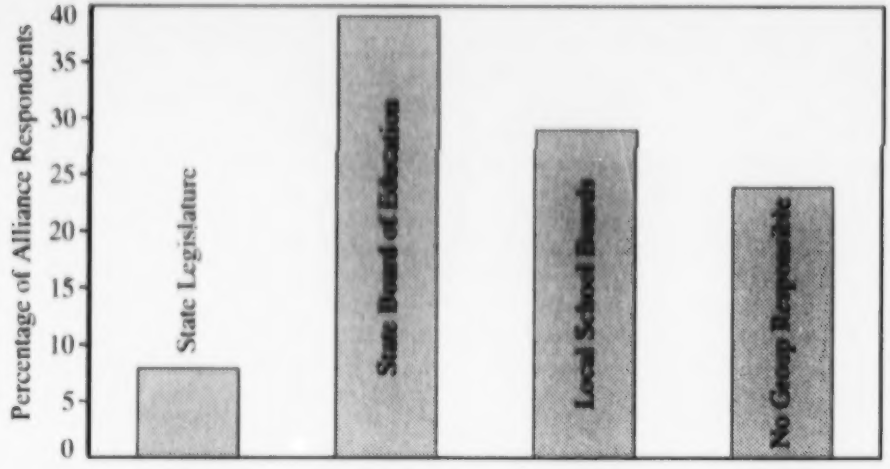
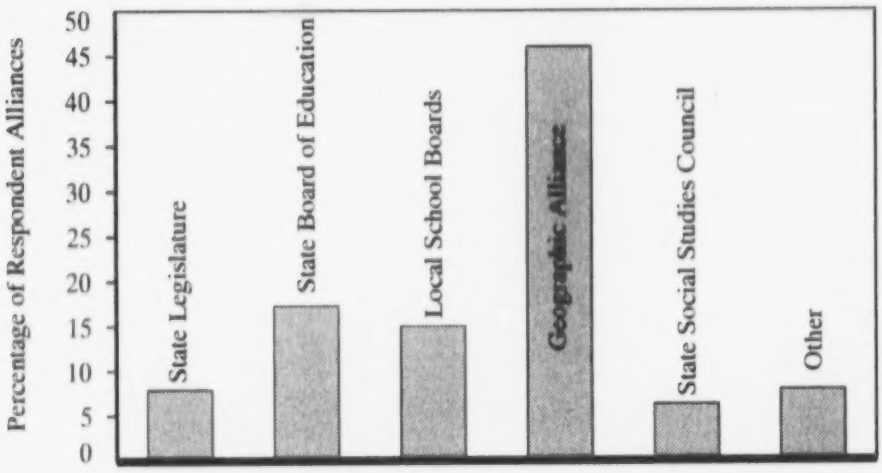


Figure 22.1 Formal policy-making groups responsible for implementing National Standards at state level

Figure 22.2 shows that 46% of the Geography Alliance Coordinators thought that their alliance would be most influential in the diffusion of the national geography standards in their state. State Boards of Education (17%), Local School Boards (15%), State Legislatures (8%,) and State Social Studies Councils (6%) followed in order of influence.
The survey data suggest that the Geographic Alliances within the various states will have to assume a strong proactive movement in support of the content standards in geography. If they do not, the process of dissemination and implementation could easily falter. This would be detrimental to the long-term future status of geography education in the United States.

22.2.7 Stage 7: assessment in geography

National assessment has always been a controversial issue within American education, but it was viewed as essential to a fundamental reform process. Test scores, it was believed, would provide the leverage necessary for widespread adoption of the changes in the systemic reform. The opponents of a national testing system claimed that it would lead to a national curriculum, that the federal government would replace local and state governments in controlling the education process, and that it would not accommodate the wide range of academic interests exemplified by the diverse population of the United States. Proponents claimed that national



Figuur 22.2 Groups most influential in diffusion of National Content Standards in Geography

testing would assure some degree of uniform quality of education across the country, would result in the attainment of an agreeable standard of performance, and would identify the basic expectations and outcomes of schooling for parents and teachers. The development of national standards was viewed by proponents as an important step in establishing a criterion level against which to measure student achievement. Since the 1960s there have been tests in mathematics, science, and language within the National Assessment of Educational Progress (NAEP), but geography was not included in the NAEP until 1988, when a pilot geography test was instituted (Allen et al. 1990). The dismal results in the 1988 NAEP-Geography and the attention given America 2000 in 1989 (National Education Goals Panel 1992), a national educational policy recommendation by the Association of State Governors, resulted in the inclusion of a full scale geography assessment in the 1994 NAEP. In preparation for the 1994 NAEP, the National Assessment Governing Board and the U.S. Department of Education sponsored a consensus building Assessment Framework Project in Geography. The project involved teachers, parents, general citizens, educators, and geographers in achieving consensus, or general agreement, about those elements of geography that should be learned by the time students reach grades 4, 8, and 12 in American schools. The resulting framework was used to develop a blueprint and later specifications for the geography test within the 1994 NAEP as shown in Table 22.1.

The preliminary analysis of the 1994 NAEP Geography results were reported in the *1994 National Assessment of Educational Progress (NAEP) Geography: A First Look* (Williams et al. 1995). The test included the first full-scale assessment of geography at grades 4, 8, and 12 in which approximately 19,000 students participated. The results of the NAEP were reported at "basic, proficient, and advanced" levels of achievement as described by National Assessment Governing Board.

Table 22.1 Geography Assessment Framework Elements

Cognitive Dimension	Content Dimension		
	Space and Place	**Environment and Society**	**Spatial Dynamics and Connection**
Knowing	Where is the world's largest tropical rain forest?	What mineral resources are often extracted by strip mining?	What factors stimulate human migrations?
Understanding	Why are tropical rain forests located near the equator?	Explain the effects of strip mining and shaft mining on the landscape.	Explain the motivations of modern day Cubans and Mexicans for immigrating to the U.S.
Applying	Support the conclusion that tropical rain forests promote wide species variation.	How can both economic and environmental interests be reconciled in an area of strip mining?	Compare current settlement and employment patterns of Cuban and Mexican immigrants in the U.S.

The test shows that, at all three grades, 70 percent of the students were at or above the "basic" level, demonstrating at least partial mastery of the subject. About a fourth of students were at or above the 'proficient' level, while two to four percent reached the 'advanced' or superior performance level.

The 1994 assessment demonstrated that students are learning more geography than the initial NAEP pilot geography test revealed in 1988 (Allen et al. 1990). However, the basic differences in the two assessments prevent any but the most general comparisons being made. It will take another NAEP-Geography in 1999 to analyze long term trends in detail.

The NAEP was designed and developed prior to the development of the national content standards. Therefore the national content standards, while incorporating much of the content and philosophy of the 1994 NAEP- Geography, extended far beyond it and encapsulated in greater breadth and depth the discipline of geography. Table 22.2 compares the main elements of the assessment framework developed for the NAEP (second column) with the five fundamental themes of geography (first column) as published in *Guidelines for Geographic Education* (Joint Committee on Geography Education 1984) and the national content standards (third column) as set out in *Geography for Life* (Geography Education Standards Project 1994). It reveals differences in the focus of each of the documents/frameworks representing the discipline.

If one looks beyond the confusion inherent in the three different documents designed to illuminate classroom teachers', curriculum designers', and parents' views of geographical education, Table 22.2 does represent three milestones. When one compares the five fundamental themes of geography with the assessment framework and the elements that encapsulate the eighteen national standards, a broadening, yet increasingly detailed perspective on the discipline is revealed.

Table 22.2 Comparing Themes, Assessment, and National Standards

Five Themes of Geography	Assessment Framework Three Content Outcomes	Elements for National Content Standards*
Location Position on the Earth's surface **Place** Physical and human characteristics. **Human/Environmental Interaction** Relationships within places **Movement** Humans interacting on the Earth **Regions** How they form and change	**Space and Place** Knowledge of geography related to particular places on the Earth; to spatial patterns on the Earth's surface; and to physical and human processes that shape such spatial patterns. **Environment and Society** Knowledge of geography related to the interactions between environment and society. **Spatial Dynamics and Connections** Knowledge of geography related to spatial variations and connections among people and places.	**World in Spatial Terms** (Standards 1-3) **Places and Spaces** (Standards 4-6) **Physical Systems** (Standards 7-8) **Human Systems** (Standards 9-13) **Environment and Society** (Standards 14-16) **The Uses of Geography** (Standards 17-18)

*See Section 22.2.6 for a listing of the Geography Content Standards 1-18.

22.2.7.1 Status of assessment in geography reform

In order to ascertain the extent to which the national content standards will influence assessment, the Alliance Coordinators were asked to reflect upon conditions in their respective states. Of the forty-four Alliance Coordinators who responded, 45% indicated their state had a high stakes assessment that published school or student aggregate scores and/or based state financial appropriations on assessment results. Fifty-five percent of the respondents indicated their state had no such plan.

The Alliance Coordinators were also asked if the national content standards and statewide assessment in their state might be coordinated or developed sometime in the future. Of the forty-four who responded, 23% replied yes, 23% replied no, and 56% replied it was not possible to predict. The small number of "yes" responses probably reflect the extent to which geography is a part of the social studies, and social studies assessment will be based on more than content standards for a single discipline such as geography or history.

22.3 The standards and international geographical education

Much of the initial concern in the United States that lead to educational reform, the national geography content standards, and national assessment was the competitive position of the country in the international market place. In the 1970s the productive capacity, quality of work, and overall ability to compete with other countries was a major concern for the United States. The lack of a clear mission for the schools in terms of both citizen responsibilities and workplace performance for students was a driving force behind the reform.

Geography education was also being scrutinized in terms of international performance and competition. One major study revealed that students at all levels of school were lagging behind similarly aged students in other countries in their knowledge of geography (Gallup Organization 1989a; 1989b).

When the national geography standard project was initiated, an international committee was appointed. During the 1992 Geographical Education Symposium of the International Geographical Union in the United States, the committee convened its members to discuss the international implications of the geography content standards. Drafts of curriculum, assessment, and classroom materials were scrutinized by the committee in order to identify the nature of "international content standards." Those early suggestions to the content standards writing process had a significant influence on the final document, *Geography for Life* (Geography Education Standards Project 1994). Throughout the development of the national content standards there was an emphasis upon writing international, or world class, standards to challenge United States students to study geography at an academic level comparable to students in other industrialized countries.

22.4 Driving systemic reforms through curriculum materials

While high stakes assessment is one way to drive systemic reform in education, there is another approach being tried. It is based on the preparation of instructional materials in geography that enable students to experience high level learning experiences that meet the content standards in geography. In the early 1990s the National Science Foundation funded two geography projects, Geographic Inquiry into Global Issues (GIGI) and Activities and Readings in the Geography of the United States (ARGUS), to produce these types of materials.

GIGI is intended for secondary school students and includes twenty modules of instruction that focus upon major issues in different regions of the world. The instructional strategy moves the students in a progression from questions to generalizations based upon geographic information and data manipulation. The materials focus the students' attention on bigger ideas and networks of concepts and principles that are interrelated. It departs from a standard textbook in that it consists of twenty separate sets of issues focused materials, and it includes print lessons, laminated atlas sheets, poster boards, an interactive geography reference pro-

gram entitled Geopedia, and video disks that are bar-coded for easy reference and recall by teachers or students (Hill et al. 1994).

The second set of geography reform based materials designed for secondary students, ARGUS, has four content areas. They are population geography, economic geography, political geography, and environmental issues, and each is presented within the context of the United States. ARGUS consists of relatively short activities that may last from one to several days, or perhaps longer with the suggested enrichment materials. Each activity has a single content focus and presents a specific analytic tool essential to geographic study. The emphasis on visual interpretation of geographic information is attained using numerous maps, graphs and tables. The materials are accompanied by a teachers manual that includes an excellent set of overhead transparencies to enhance instruction and a fully integrated curriculum development-ROM (Gersmehl 1995).

The geographic context for the GIGI materials is the world. As a result of using the materials, students would have a rich background in world geography via the global issues studied. GIGI relies upon in-depth investigation of topics and issues within particular regions. ARGUS focuses exclusively on the United States. It is not a general treatment of the country, but rather a series of in-depth studies of topics which are significant to understanding the spatial patterns that have developed over time and which are prominent in the social and economic functioning of the country.

The GIGI and ARGUS materials set and promote high academic standards, involve the students in the processes of geographic inquiry, and enable students to meet national and state content standards in geography. Neither project is a traditional textbook. Rather they include the information that students need to engage in geographic inquiry consistent with the national content standards. If the slide to de facto mediocrity can be reversed by high quality materials in the hands of students and teachers, then these two projects test the role of quality materials in the theory of systemic reform in education.

22.5 Summary

The authors identified stages in the development of systemic reform in geographical education in the United States. The stages were significant because they reflected reform activities at that particular time, they were responsible for raising the public's perception of geography, and they directed the attention of policy makers to geography in the school curriculum. In many ways, the early survey and test results provided an important launching pad from which geographic education initiatives could be considered and designed. The reports issued by nationally appointed committees and study groups were important in bringing the state of geographic literacy to the attention of policy makers. The philosophical underpinnings and rationales presented by those reports were important in the search for solutions to the problems facing geography in schools. The dissemination of ideas through the increased attention to textbook and other materials by publishers were examples of the increasing importance of geography via both printed and audio visual materials. The diffusion of information about geographic issues of concern in the classroom was accomplished by the Geographic Alliance Network. The reinvigoration of geographic education in the United States in general has been

greatly enhanced by national content standards and national assessment, both important to systemic reform, as well as the financial commitment of the National Geographic Society and other projects funded by private and governmental agencies. However, it will require a considerable professional commitment by classroom teachers and professional geographers to catch the imagination of students studying geography in order for the reforms to become a national reality (Hill 1989). Theoretically, the combined effects of the national content standards and the systematic assessment of geography attainment of students are major steps being taken towards excellence. The NAEP-Geography is an early, objective indicator that the slide towards mediocrity has been reversed. In order for the theory to be more fully tested, periodic measurements of achievement will be required. In addition, studies of the commitment and enthusiasm to make changes in curriculum materials must be pursued. Increased expectations by citizens regarding geographic standards, and the long term involvement by professional geographers, teachers, and policy makers are a major part of the effort to sustain the reform in geography teaching underway in the United States.

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